Guidance on Responding to Petitions and Conducting Status Reviews under the Endangered Species Act – updated May 26, 2016

Introduction

This document provides guidance for responding to petitions (or initiating actions) to list, reclassify, or delist species as threatened or endangered under section 4 of the Endangered Species Act (ESA). This guidance updates and replaces the Status Review Guidance issued in 2013 by the Office of Protected Resources (NMFS Protected Resources Office 2013). The goal of this guidance is to establish a standardized approach to responding to petitions to list, delist, or reclassify species, conducting status reviews (in response to a petition or self-initiated), and making listing determinations under section 4 of the ESA. This guidance is intended to foster more transparent, well documented, objective, and scientifically and legally defensible determinations. [1]

The updated guidance is presented in sections corresponding to three major steps associated with a typical listing process: (I) evaluating petitions; (II) conducting a status review; and (III) developing a recommended ESA listing determination. **Figure 1** outlines the steps for conducting a status review. Each of these steps is discussed in detail. Appendices are also included to provide: ***Boilerplate Language for Preamble of 90-day Findings on Petitions to List*** (**Appendix A**); ***General Conceptual Guidance for Evaluating Extinction Risk*** (**Appendix B**); ***Qualitative Risk Analysis Tools and Expert Opinion*** (**Appendix C**); ***Examples of Significant Portion of its Range Analyses*** (**Appendix D**); ***Template for a Terms of Reference Document*** (**Appendix E)**; and a ***Template for a Table of Contents for a Status Review Report*** (**Appendix F**).

This guidance also clarifies staff roles and responsibilities as they relate to the overall listing process. Detailed guidance and protocols related to the rulemaking process (writing Issues Advisories, developing rollout plans, preparing *Federal Register* Notices, etc.) are available on the Protected Resources intranet (see http://home.nmfs.noaa.gov/pr/guidance/regulations/) and are not covered in detail within this document. Also, ESA policies referenced within this document are available at: http://www.nmfs.noaa.gov/pr/laws/esa/policies.htm.

I. Evaluating Petitions

When a petition to list a species under the ESA is received, a determination needs to be made on how its review will be handled. For species whose distribution is within a single region, that region will conduct the review. For species whose distribution encompasses two regions, the two Regional Administrators (RAs) should decide whether: (1) one region will take the lead; (2) the regions will collaborate and make recommendations jointly; or (3) the petition should be referred to the Office of Protected Resources (F/PR). In the latter case the F/PR can decide to

[1] This document sets out internal guidance that is intended to be applied consistently by NMFS staff in carrying out their duties. It is not intended to, and does not create any right or benefit (substantive or procedural) enforceable by any party at law or in equity. This revision was issued by the Director of the Office of Protected Resources on December 11, 2015, and modified slightly on May 26, 2016.

accept the lead or ask a region to do so. For species whose distribution encompasses more than two regions or that occur only outside of U.S. jurisdiction, F/PR will generally take the lead. In the event of a disagreement, the Deputy Assistant Administrator for Regulatory Programs (DAARP) will determine a lead office or region.

The U.S. Fish and Wildlife Service (USFWS) shares jurisdiction with NMFS in implementing the ESA. Guidance for sharing jurisdiction is contained in Reorganization Order No. 4 of 1970, the 8/28/74 Memorandum of Understanding between the U.S. Fish and Wildlife Service and the National Marine Fisheries Service regarding Jurisdictional Responsibilities and Listing Procedures under the Endangered Species Act, and the 2015 Memorandum of Understanding Defining the Roles of the U.S. Fish and Wildlife Service and the National Marine Fisheries Service in Joint Administration of the Endangered Species Act of 1973 as to Sea Turtles. Occasionally petitions are submitted to one agency for species under the jurisdiction of the other. In cases where NMFS receives a petition for a species it believes falls under the jurisdiction of the USFWS, the lead region or F/PR should notify USFWS to verify the species falls under USFWS jurisdiction. If USFWS does not agree, the issue should be referred to F/PR for resolution. If USFWS agrees to accept the petition, it will be referred to USFWS and a letter sent to the petitioner indicating USFWS is the responsible agency for that species. If NMFS decides to exercise jurisdiction, then the petition will be referred back to the lead region for processing. Shared jurisdiction with FWS is not a desirable outcome and should occur only in rare instances where it would result in a conservation benefit to the species or is governed by an existing Memorandum of Understanding. In those rare instances, a specific MOU should be developed to define how jurisdiction will be shared should the species be listed.

Throughout the processing of each petition, the lead region should initiate and maintain consistent contact with the lead F/PR biologist (F/PR biologist assigned to the action) to ensure consistency of approach, plan timelines, and complete administrative and reporting requirements. The lead region is responsible for developing and sending an acknowledgement letter to the petitioner within 30 days of the receipt of a valid petition (See the ESA and section 4 regulations (50 CFR 424.14) to determine if a petition is valid; see discussion below). The RA should also notify the directors of any relevant State fish and wildlife agencies that NMFS has received a petition and is evaluating it in accordance with the ESA's petition standards; however, as discussed below, we should neither solicit nor consider additional information from these entities at this stage.

To the maximum extent practicable, within 90 days of receiving a petition to list a species under the ESA, NMFS must determine whether the petition contains substantial scientific or commercial information to indicate that the petitioned action *may* be warranted. As soon as possible after a petition is received, the lead entity should determine the location and content of pertinent agency files and begin to gather that information for consideration in review of the petition. The Region evaluates the information contained and cited in the petition in the context of other available information in agency files, and consults with any other NMFS staff (including staff at the science centers) with relevant expertise, to develop a 90-day finding. The Region and Science Center may search files in other NMFS locations.

ESA-implementing regulations issued jointly by NMFS and FWS (50 CFR 424.14(b)) define *substantial scientific or commercial information* in the context of reviewing a petition to list, delist, or reclassify a species as the amount of information that would lead a reasonable person to believe that the measure proposed in the petition *may be* warranted. Conclusive evidence is not required.[2] In evaluating whether substantial information is contained in a petition, the region or F/PR must consider whether the petition: (1) clearly indicates the administrative measure recommended and gives the scientific and any common name of the species involved; (2) contains detailed narrative justification for the recommended measure, describing, based on available information, past and present numbers and distribution of the species involved and any threats faced by the species; (3) provides information regarding the status of the species over all or a significant portion of its range; and (4) is accompanied by the appropriate supporting documentation in the form of bibliographic references, reprints of pertinent publications, copies of reports or letters from authorities, and maps (50 CFR 424.14(b)(2)). Judicial decisions have clarified the appropriate scope and limitations of the Services' review of petitions at the 90-day finding stage, in making a determination that a petitioned action *may be* warranted. As a general matter, these decisions hold that a petition need not establish a "strong likelihood" or a "high probability" that a species is either threatened or endangered to support a positive 90-day finding.

The Region or F/PR should evaluate the petitioners' request based upon the information in the petition, including its references and the information readily available in NMFS files. The Region or F/PR may not conduct additional research at this stage and may not solicit information from parties outside the agency to help evaluate the petition.[3] The Region or F/PR will accept

[2] The initial 90-day review of a petition is limited to whether the petitioner has met the "substantial information" threshold to establish that the petitioned action *may be warranted*. Application of this standard does not require conclusive evidence that the action is warranted. See, e.g., *Morgenweck*, 351 F. Supp. 2d at 1141 ("[T]he ESA does not contemplate that a petition contain conclusive evidence of a high probability of species extinction to warrant further consideration of listing that species."); *Moden v. USFWS*, 281 F. Supp.2d 1193, 1203 (D. Or. 2003) ("[T]he regulations define "substantial" information in non-stringent terms. . . ."). A petition should not be denied merely because information is arguably stale or because the agency has contradictory information. See *Colorado River Cutthroat Trout*, 448 F. Supp.2d at 177 ("While some of the data cited in plaintiffs' Petition might have been stale, it does not necessarily follow that it was inadequate or incorrect."); *Ctr. for Biological Diversity v. Kempthorne*, No. 06-04186, 2007 WL 163244, *4 (N.D. Cal. 2007) (unreported) ("It would be wrong to discount the information submitted in a petition solely because other data might contradict it. At this stage, unless the Service has demonstrated the unreliability of information that supports the petition, that information cannot be dismissed out of hand."). Information presented by the petitioner should generally be credited unless the agency has specific information to the contrary; even information of questionable accuracy, or that was developed for another purpose, may constitute substantial information. *Norton*, 2007 WL 2827375 at **4-6.

[3] Several court rulings provide guidance as to what information can be considered in the agency's review of petitions at the 90-day stage. Most importantly, information must be either provided in the petition (or cited in it) or available within agency files. See, e.g., *W. Watersheds Project v. Norton*, No. CV 06-00127, 2007 WL 2827375, *7 (D. Idaho Sept. 26, 2007) ("The ESA expressly limits the Service to reviewing the information presented in the Petition and the information contained in the Service's files.")(unreported). Staff reviewing the petition must not seek out additional information to answer questions (even from state or federal agencies) not answered by information presented in the petition. See, e.g., *Colorado River Cutthroat Trout v. Kempthorne*, 448 F. Supp.2d 170 (D. D.C. 2006) (90-day review is to be based on the petition alone or in combination with agency's own records, and consultation with states or other federal agencies must await the 12-month review process); *Ctr. for Biological Diversity v. Morgenweck*, 351 F. Supp.2d 1137 (D. Colo. 2004) (soliciting information from state and federal agencies goes beyond the scope of review at the 90-day stage; however, the agency can rely on its own expertise and

the petitioners' sources and characterizations of the information presented if they appear to be based on accepted scientific principles, unless the Region or F/PR has specific information in its files that indicates the petition's information is incorrect, unreliable, obsolete, or otherwise irrelevant to the requested action. Information that is susceptible to more than one interpretation or that is contradicted by other available information will not be disregarded at the 90-day finding stage, so long as it is reliable and a *reasonable person*[4] would conclude it supports the petitioners' assertions. Conclusive information indicating the species may meet the ESA's requirements for listing is not required to make a positive 90-day finding.

To make a 90-day finding on a petition to list a species, the Region or F/PR must evaluate whether the petition presents substantial scientific or commercial information indicating the subject species may be either threatened or endangered, as defined by the ESA. First, the Region or F/PR will evaluate whether the information presented in the petition, along with the information readily available in NMFS' files, indicates that the petitioned entity may constitute a "species" eligible for listing under the ESA. Next, the Region or F/PR will evaluate whether the information indicates that the species may be in danger of extinction or likely to become so within the foreseeable future under the reasonable person standard; this may be indicated in information expressly discussing the species' status and trends, or in information describing impacts and threats to the species, or both. The Region or F/PR will evaluate the information on specific demographic factors pertinent to evaluating extinction risk for the species (e.g., population abundance and trends, productivity, spatial structure, age structure, sex ratio, diversity, current and historical range, habitat integrity or fragmentation), and the potential contribution of identified demographic risks to extinction risk for the species. The Region or F/PR will then evaluate the potential links between these demographic risks and the causative impacts and threats identified in section 4(a)(1).

In cases where the petition requests that we list the taxonomic species (or subspecies) or any distinct population segments (DPSs) that may exist, the Region or F/PR will first determine whether the petition or information readily available in NMFS files indicates that the taxonomic species may be in danger of extinction or likely to become so within the foreseeable future. If it does, the analysis will end there and a status review will be initiated on the taxonomic species (though the Region or F/PR may decide to consider whether there are DPSs after considering whether the potential to list as DPSs might provide an overriding conservation benefit to the

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records). It is problematic even to contact an expert cited in the petition for clarification. *W. Watersheds Project v. Hall*, No. 06-0073, 2007 WL 2790404 (D. Idaho Sep. 24, 2007) (unreported) (personal communication with a cited expert was improper, although in this particular case it turned out not to have influenced the agency's finding and so was harmless error). Collection and review of a broader set of information is appropriate only in the context of a status review.

[4] Under current regulations, this *reasonable person* standard does not mean a reasonable scientist, just a reasonable person. See 50 C.F.R. 424.14(b)(1). In some circumstances, disagreement among biologists may actually indicate that a reasonable person would conclude the action may be warranted. See *Ctr. for Biological Diversity v. Kempthorne*, No. 07-0038, 2008 WL 659822, *12 (D. Ariz. 2008) (unreported) ("[T]he 90-day finding's 'may be warranted' standard merely requires the consideration of whether a 'reasonable person' could conclude that the petitioned action may be warranted. Thus, it appears that where there is reasonable disagreement among people, the 'may be warranted' standard is satisfied, and the FWS should publish a positive 90-day finding and proceed with a status review, at which time the FWS may employ the more-searching 'is warranted' standard.").

species; see II.B. Identifying Distinct Population Segments, if Appropriate). If it does not, and the petition includes a request to list specified DPSs (as opposed to generally requesting that we list any DPSs we may identify), the Region or F/PR will determine whether the petition or information readily available in NMFS' files indicates that the petitioned population(s) may meet the DPS Policy criteria[5] and that this population(s) may face an extinction risk that is cause for concern under the reasonable person standard. If so, a status review will be initiated on the population(s). In evaluating whether the petition or information readily available in NMFS' files indicates that the petitioned population(s) may meet the DPS Policy criteria, the Region or F/PR will not do a full DPS analysis, but just enough to determine whether the petitioned population(s) may meet the DPS Policy criteria (based on the petition and information readily available in NMFS files).

Information presented on impacts or threats should be specific to the species, and should reasonably suggest that one or more of these factors may be operative threats that act or have acted (or will act within the foreseeable future) on the species to the point that it may warrant protection under the ESA. Broad statements about generalized threats to the species, or identification of factors that could negatively impact a species, are unlikely to constitute substantial information indicating that listing may be warranted. The Region or F/PR will evaluate whether the petition presents information indicating that not only is the particular species exposed to a factor, but that the species may be responding in a negative fashion or is expected to do so within the foreseeable future; then the Region or F/PR will assess the potential significance of that negative response.

Many petitions identify risk classifications made by non-governmental organizations, such as the International Union on the Conservation of Nature (IUCN), the American Fisheries Society, or NatureServe, as evidence of extinction risk for a species. These classifications may be informative, but the classification alone may not provide the rationale for a positive 90-day finding under the ESA because they may have different criteria, evidence requirements, or purposes. Thus, when a petition cites such classifications, it must also include the information supporting that classification or the Region or F/PR must be able to locate that information in their files.

A petition to list a species for which we have recently denied another petition or recently completed a status review and determined that listing is not warranted generally will be denied again, unless new information not previously considered to indicate that the petitioned action may be warranted is presented in the new petition.

If the Region or F/PR finds that the petition presents substantial information indicating that the petitioned action *may be* warranted (i.e., a positive 90-day finding), it will publish the finding in the *Federal Register* and notify the public that it is commencing a review of the status of the species and seeking information relevant to the status review and listing determination, and will make a determination on whether the action *is* warranted within 12 months of *receiving the petition* (pursuant to 50 CFR 424.14). If, however, the Region or F/PR finds that the petition does not present substantial information indicating that the entity being petitioned is a "species"

[5] See policy regarding the recognition of DPSs of vertebrate species under the Endangered Species Act (DPS Policy, 61 FR 4722; February 7, 1996).

under the ESA or that the petitioned action may be warranted (i.e., a negative 90-day finding), the review is concluded with publication of a *Federal Register* notice to announce that finding. See Appendix A for boilerplate language captured in the discussion above that should be included in the preamble of all 90-day findings.

A 90-day finding is usually prepared by the Region or F/PR staff); recommended by the RA (or multiple RAs in cases where a species occurs in more than one region) or F/PR; reviewed and edited by F/PR, approved by the AA or DAARP, NOAA (if "high interest" or controversial), DOC, and ultimately signed by the AA or DAARP and published in the *Federal Register*. The Region or F/PR will inform the Science Center or F/ST when a 90-day finding is published. The process for preparing and clearing a *Federal Register* notice is described on the F/PR intranet page: http://home.nmfs.noaa.gov/pr/guidance/regulations/.

The positive 90-day finding will be used to identify and request information on key information gaps and to solicit all relevant information on the status of the species, threats, habitat needs, and ongoing or planned conservation efforts. The lead region or F/PR will also notify the state fish and wildlife agency for the states, tribes, and foreign countries in which the species under review exists that NMFS has made a positive 90-day finding on a petition and is initiating a status review. [6]

[6] Pursuant to the Interagency Cooperative Policy Regarding the Role of State Agencies in Endangered Species Act activities, NMFS policy is to cooperate with states in making listing determinations. http://www.nmfs.noaa.gov/pr/laws/esa/policies.htm#listing

II. Conducting a Status Review

Once the Region or F/PR determines that the petition has presented substantial scientific or commercial information indicating that the petitioned action may be warranted, it initiates a status review of the species to determine whether the species is actually threatened or endangered under the ESA. An ESA status review can also be initiated by NMFS, without a petition. The purpose of a status review is to synthesize the best available scientific and commercial information regarding the species' status, which includes its life history, demographic trends, and susceptibility to threats, and evaluate extinction risk of the species. This information is compiled, analyzed and then generally (but not always) documented in a Status Review Report. In some cases it may be appropriate to prepare several reports that focus on different aspects of the species' status or issues related to evaluating extinction risk, such as conservation efforts to protect the species. In other, usually simpler cases, it may not be necessary to develop a separate, stand-alone document from the 12-month finding. Whatever approach is taken, all of the information must be tied together in the 12-month finding that reflects the agency's determination and rationale. If certain data have already been compiled and analyzed by a credible entity, the region or F/PR does not need to repeat this work but need only present and explain the determination, with references to the underlying information compilations. For the remainder of this guidance, however, we will refer to a Status Review Report, with the understanding that there are other ways to gather and analyze the best available information when conducting a status review.

The lead RA(s) or F/PR (See I. Evaluating Petitions for discussion on how the lead is determined) will decide whether to convene a Status Review Team (Team) or take an alternative approach such as assign a regional or F/PR biologist to conduct the status review, request that a science center biologist conduct the review (through the appropriate Science Center Director), or hire a contractor to prepare a status review report. Assignment of the status review to a regional/science center biologist or contractor can save time and resources because only one person is responsible for the product, and logistical issues associated with a Team may be avoided.

Situations in which convening a Team may be appropriate include:

- The status review addresses more than one species;
- The range of the species extends across two or more regions or ocean basins;
- There is an expectation that there could be substantial disagreement or uncertainty in interpreting the best available data, and the RA or F/PR feels it is important to have the broad sample of opinions and expertise of a Team;
- The RA or F/PR feels that a single biologist may not be best able to meet the ESA standard for obtaining and analyzing the best available information.

In other cases, it may be more appropriate to assign the task of compiling the best available information on the species to one biologist and then appoint an Extinction Risk Assessment (ERA) team to evaluate the extinction risk to the species.

If a Team (or ERA team) is to be established, the RA(s) will consult with the appropriate Science Center Director(s) to determine Team composition (or, when F/PR has the lead, the F/PR Director will consult with the F/ST Director); if the RA(s) and Science Center Director(s) (or F/PR and F/ST Directors) cannot agree on Team composition, the Assistant Administrator for Fisheries will decide. In those cases where a species' jurisdiction will be shared by both NMFS and USFWS, consultation with USFWS by either the RA, or if assigned to F/PR, the Office Director of F/PR will be necessary to determine who will be involved in conducting the status review. When a Team is convened, individuals serving on the Team should have expertise in the particular species' biology, population dynamics or ecology, or other relevant disciplines (e.g., ocean/environmental/climate processes, analytical techniques, population genetics, extinction risk, or pertinent threats). It is up to the discretion of the RA (or F/PR) – in consultation with the Science Center Director(s) (or F/ST Director), as necessary – whether a Regional Office or F/PR representative with ESA expertise will be a full member of the Team or serve as a Liaison only. In either case, the Regional Office or F/PR representative should provide ESA policy expertise (e.g., the established meaning of "endangered species" and "threatened species," the "Distinct Population Segment" Policy, and the "Significant Portion of its Range" Policy) to the Team's deliberations. Team members are expected to: attend meetings regularly; gather and assess species information; investigate historical and current rates of decline; identify threats to the species; estimate extinction risk to the species; and contribute to appropriate portions of the status review report in a timely manner. The Team Liaison's responsibilities are to: (1) serve as a conduit for communication between the Team and the Regional Office/F/PR and between NMFS and other NOAA offices as appropriate; (2) assist in coordination of meetings and attend meetings; (3) provide advice concerning the ESA listing/delisting process, (4) serve as the principal point(s) of contact concerning the status review report and peer review thereof; and (5) serve as Custodian of the Decision File for the record.

NMFS must also consider Team composition in light of the Federal Advisory Committee Act (FACA). Generally, any committee or group established for the purpose of providing consensus advice or recommendations to a Federal agency is subject to the procedural requirements of FACA. Teams are subject to FACA because their assessments constitute group advice upon which NMFS will largely base its determinations on whether to list species as Endangered or Threatened under the ESA. As such, the Team must be composed solely of Federal officials and employees (i.e., NMFS affiliates *cannot* be Team members) unless the Team falls within an exemption to FACA. One applicable exemption would allow elected officers of state, local, and tribal governments (or their designated employees with authority to act on their behalf) to participate on a Team if they do so in their official capacity for the purpose of providing expertise on species biology or a relevant risk factor. To include input from non-federal experts, NMFS can: (1) invite such individuals to participate as guest consultants/experts to the Team as part of a broad-based gathering of information or individual (not group) advice or (2) obtain an assessment as a deliverable from a contractor under a procurement contract, as long as any decisions about who should contribute to the report under such a contract are made by the contractor and not NMFS.

A Team can include Federal employees from NMFS F/PR, F/ST, regional, and science center staff, and other federal agency staff, and, when appropriate as described above, state, local, or tribal representatives. A key consideration in designing the membership of a Team is the ability

to ensure the agency meets the requirement to use the best available scientific and commercial information standard and complies with all other regulatory and statutory requirements. Every Team will have a Regional Office or F/PR liaison or member to provide oversight and guidance, to ensure the Team effectively meets statutory and regulatory requirements and to ensure consistency with agency policies and prior determinations. A liaison may also participate on a Team if they have relevant expertise (e.g., species biology, protective regulations, conservation biology).[7] One or two Team members typically should serve as Team chair(s) (usually nominated during the first Team meeting) to coordinate logistics of Team meetings, facilitate Team discussions, assign analyses and writing assignments to Team members, and compile and edit the final status review report. The Region (or F/PR), in consultation with the Team Chair, will develop the Terms of Reference (TOR)[8] that the Team will be expected to follow. To ensure that only the best scientific and commercial information is considered by the Team, the TOR should cite our regulations at 50 C.F.R. §424.11(b), which expressly preclude consideration of economic and other non-scientific impacts as part of listing decision.

If an individual staff person is conducting the status review, the Region should document the TOR, which staff will follow.

All staff participating in a status review must adhere to the NOAA Scientific Integrity Policy (NAO 202-735D) and otherwise maintain an objective approach to the process (http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_202/202-735-D.pdf).

The general steps to conducting a status review of a species are described below (See **Figure 1**), but see the text for details not included in Figure 1.

[7] If a regional office or F/PR staffer is a member of a Team, he or she can also continue to provide oversight and guidance to ensure the review is generally consistent with prior reviews and that statutory and regulatory requirements are met. It is not necessary to have another liaison in addition to the Regional Office or F/PR Team member.

[8] A Terms of Reference is a document that outlines the responsibilities of the biologist, Team, or contractor for conducting an ESA status review of a species and preparing a Status Review Report. See Appendix E for a template for a TOR.

II. Conducting a Status Review of a Species

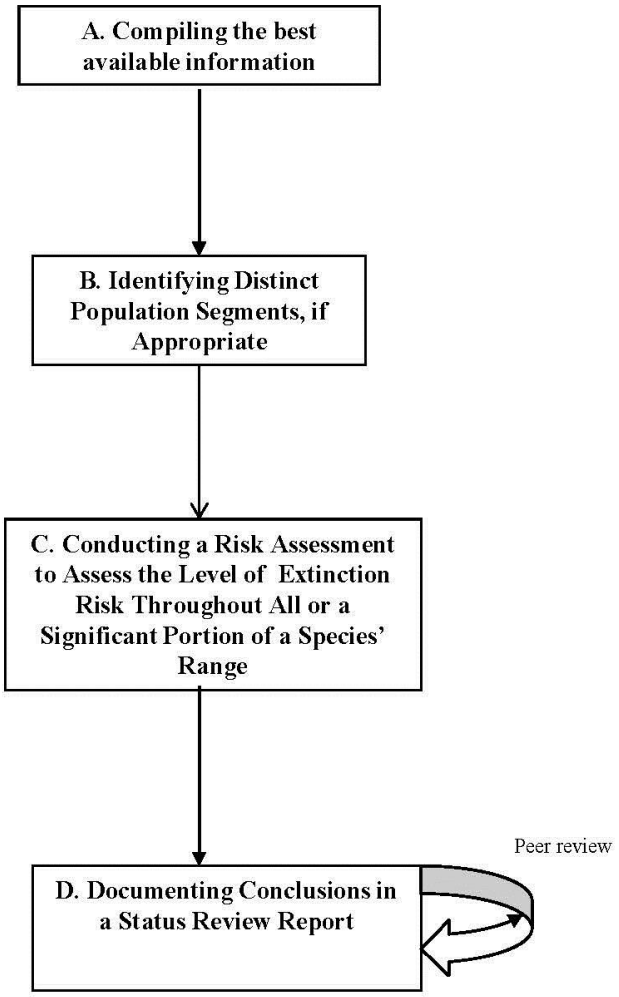

Figure 1. General procedure for conducting a status review of a species. Roman numeral and letters (II.A. – D.) correspond to the steps described in the text.

A. Compiling the Best Available Information

To compile the best available scientific and commercial[9] data, the biologist (or Team) will search the relevant literature for information on the species, its habitat, and threats to its existence. The biologist (or Team) will also solicit information from experts in the species' biology and/or individuals with expertise in particular risk factors which may be threatening a species. Scientific and commercial data will also be solicited from states, other federal agencies, foreign governments, tribes, academia, individuals, nonprofit organizations, industry groups, etc., through, at a minimum, the *Federal Register* notice of the 90-day finding.

The compiled data, which also includes any information received in response to a positive 90-day finding, should describe the life history and ecology of the species, and will likely include information on taxonomy, historical and current abundance, trends, population growth rate, distribution, population connectivity, genetic diversity, and threats facing the species. Typically, new empirical studies would not be conducted during a status review prompted by a petition because the ESA requires the use of the best *available* scientific and commercial information (emphasis added) and it sets out strict deadlines for completing status reviews.

While the biologist (or Team) gathers information on the species' status, the region(s) will gather information on protective efforts for the agency's evaluation. When specifically included in the TOR for the Status Review Report, information about protective efforts can also be collected by the biologist (or Team). This information will be used by the Region or F/PR later (See III. Developing a Recommended ESA Listing Determination).

B. Identifying Distinct Population Segments, if Appropriate

To be considered for listing under the ESA, a group of organisms must constitute a "species," which is defined in section 3 of the ESA to include "any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature." NMFS and USFWS jointly published a policy regarding the recognition of DPSs of vertebrate species under the Endangered Species Act (DPS Policy, 61 FR 4722; February 7, 1996). Prior to that, NMFS published a policy (ESU Policy, 56 FR 58612; November 20, 1991) describing the agency's application of the ESA definition of "species" to anadromous Pacific salmon population segments, which are referred to in the policy as "evolutionarily significant units" (ESUs). NMFS has applied the 1991 ESU policy in identifying West Coast salmon species (*Oncorhynchus* spp., including sockeye, Chinook, coho, chum, and pink salmon).

While a "DPS" is in part a scientifically understood term, it is a term that is used specifically in the context of ESA law and policy. Furthermore, a congressional report that followed the inclusion of the provision to list DPSs indicated that this provision should be used sparingly. S. Rep. 96-151 (1979). NMFS has discretion with regard to listing DPSs and, in order to be

[9] "Commercial" information means information such as fisheries logbook data, trade statistics; in other words, information that sheds light on the biological status of a species. This does not include information on the economic impacts of listing a species as threatened or endangered.

consistent with this congressional language and because we believe that in many cases recognition of DPSs would unduly complicate species management and divert resources without furthering the conservation purposes of the statute, we will generally not, of our own accord, evaluate listings below the taxonomic species or subspecies level if the best available information indicates that the species or subspecies is in danger of extinction throughout all or a significant portion of its range (endangered) or likely to become so in the foreseeable future (threatened). In cases where the biologist (or Team) has concluded that the extinction risk to the taxonomic species or subspecies is low (see Section II.C.2. below), and the petition has requested that a particular population be identified and listed as a DPS for which we have issued a positive 90-day finding, the biologist (or Team) should apply the DPS Policy and identify potential DPSs. Note that in order to evaluate the status of a DPS, the biologist (or Team) must acknowledge the potential existence of at least one other DPS. .

In cases where we have discretion over whether to evaluate a species as DPSs (i.e., we were not petitioned to list a particular population, or we issued a positive 90-day finding on a petition to list a taxonomic species but issued a negative 90-day finding on the petition's alternative request to list several populations as DPSs), the Region (or F/PR) and the biologist conducting the status review will discuss whether dividing a species into DPSs and evaluating their status would likely result in an overriding conservation benefit to the species. In cases where a team has been convened, the Team Chair will meet with the Region (or F/PR) soon after being designated Team Chair to discuss this DPS issue and confer regarding development of the TOR by the Region (or F/PR). If there is likely to be an overriding conservation benefit to the species, the Region (or F/PR) will determine whether a DPS analysis is warranted, and if so, that task for the biologist (or Team) will be included in the TOR.

The following questions can help the Region (or F/PR) and the biologist (or Team Chair) evaluate whether such a conservation benefit may exist.[10]

a) Are some populations of a species or subspecies more at risk, or not at risk, or are some populations facing unique threats?
b) Can we better preserve genetic integrity by listing as DPSs?
c) Would ESA protections or recovery be expedited by focusing on one or more DPSs instead of the entire species' range?
d) Will processing multiple actions associated with multiple DPSs take away from protection of this or other species?
e) If dividing an already-listed species with critical habitat in place into DPSs, will the circumstances allow the agency to take steps to avoid a gap in protection of habitat for the DPSs?
f) Will mixing of individuals among DPSs make it difficult to quantify and monitor take if we list separate DPSs instead of one taxonomic species or subspecies?
g) Will the need to redo any section 4(d) regulations for newly listed DPSs of a species previously listed rangewide result in lapses in protections (i.e., can a new section 4(d) regulation be published simultaneously with the new DPS listing(s))?

[10] Note that these questions do not include biological factors for meeting the DPS criteria of the Policy Regarding the Recognition of Distinct Vertebrate Population Segments (61 FR 4722; February 7, 1996 - DPS Policy), used by biologists or teams in determining whether any population segments qualify as DPSs.

h) Is a population experiencing unusual mortality or is abundance trend different from other populations?

Of course, if NMFS is petitioned to list a particular population of a vertebrate species (and not the entire taxonomic species) and the petition provides substantial information to support identifying the population as a DPS, then the biologist (or Team) will evaluate, based on the DPS Policy criteria, whether that population indeed qualifies as a DPS.[11] If it does not, the review will end here unless the TOR includes instructions to go further, in which case, the biologist (or Team) will determine whether that population is part of some other DPS and identify that DPS. If a petition to delist a DPS from a larger listed entity such as a species-level listing is received, consult with OPR for the latest guidance on how to proceed.

C. Conducting a Risk Assessment to Assess the Level of Extinction Risk Throughout All or a Significant Portion of a Species' Range

The ESA contains key terms that need to be defined or interpreted before we can determine whether a species is threatened or endangered:

Endangered species: Any species which is in danger of extinction throughout all or a significant portion of its range. NMFS interprets an "endangered species" to be one that is presently in danger of extinction.

Threatened species: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. A "threatened species" is not presently in danger of extinction, but is likely to become so in the foreseeable future. So, the primary statutory difference between a threatened and endangered species is the timing of when a species may be in danger of extinction, either presently (endangered) or in the foreseeable future (threatened). Being in danger of extinction "presently" does not mean that the possible extinction event is now, but that we can discern the danger now.

Foreseeable future: For the purpose of this guidance, the "foreseeable future" describes the extent to which the Secretary can, in making determinations about the future conservation status of the species, reasonably rely on predictions about the future (Department of the Interior Solicitor's Memorandum M-37021, "The Meaning of 'Foreseeable Future' in Section 3(20) of the Endangered Species Act"(Jan. 16, 2009)). Those predictions can be in the form of extrapolation of population or threat trends, analysis of how threats will affect the status of the species, or assessment of future events that will have a significant new impact on the species. The biologist (or Team) should consider the life history of the species, habitat characteristics, availability of data, kinds of threats, ability to predict threats and their impacts, and the reliability of models used to forecast threats over that "foreseeable future" in determining the time period that constitutes the foreseeable future. This approach does not limit the time frame under consideration to the length of time into the future for which a species' status can be quantitatively modeled or predicted within predetermined limits of statistical confidence, but uncertainties of any modeling efforts should be documented. Furthermore, because a species

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may be susceptible to a variety of threats for which different data are available, or which operate across different time scales, the foreseeable future may not necessarily be reducible to a particular number of years. Regardless, a single, numerical "foreseeable future," several numerical "foreseeable futures" for different relevant threats, or a non-numerical "foreseeable future" should be defined early in the status review process, and a strong rationale for identifying a particular "foreseeable future" should be documented in the Status Review Report.

Significant portion of its range: A portion of the range of a species will be considered "significant" if the species is not currently endangered or threatened throughout its range, but the portion's contribution to the viability of the species is so important that, without the members in that portion, the species would be in danger of extinction, or likely to become so in the foreseeable future throughout its range (Final Policy on Interpretation of the Phrase "Significant Portion of its Range" in the Endangered Species Act's Definitions of "Endangered Species" and "Threatened Species," 79 FR 37578; July 1, 2014 [Final SPOIR Policy]).

1) *Description and Evaluation of Demographic Risks and Section 4(a)(1) Factors*

Demographic risk analysis

Once the best available information has been compiled, the biologist (or Team) will evaluate the demographic risks facing the species, subspecies, or, when included in the TOR, any identified DPSs of a vertebrate population. To do this, the biologist (or Team) should consider the key principles of conservation biology that influence the persistence of the species (see McElhany et al., 2000). McElhany et al. (2000) describe an approach (the Viable Salmonid Population (VSP) approach) to evaluating the viability of salmonid populations and include useful guidance on how to consider the demographic descriptors of *abundance*, *spatial distribution*, *productivity*, and *diversity* at the population level, and the effect of catastrophes and long-term demographic and evolutionary processes at the Evolutionarily Significant Unit (ESU) level. To clarify that the approach may be applied to any species under NMFS' jurisdiction (not only salmon), we refer to it here as the Viable Population (VP) approach. Wainwright and Kope (1999) describe a matrix method where different demographic descriptors are ranked according to their contribution to extinction risk. NMFS has used an approach that combines the ideas from these two papers in numerous status reviews (e.g., see status review reports and *Federal Register* notices for Pacific salmonids, killer whale, green sturgeon, eulachon, and corals by clicking on the appropriate species group in the upper right hand corner of the following web site: http://www.nmfs.noaa.gov/pr/species/index.htm and then clicking on a particular species).

The VP approach provides a useful starting framework for the extinction risk assessment (see Section II.C.2), as it guides the biologist (or Team) through a demographic risk analysis. It begins with an evaluation of the quality and extent of the available data on four biological descriptors of the status of the species: abundance, spatial distribution, productivity, and diversity.

> *Abundance*: Small populations face a host of risks intrinsic to their low abundance; conversely, large populations exhibit a greater degree of resilience. A large part of the science of conservation biology involves understanding and predicting the effects of population size. All else being equal, small populations are at greater risk of

extinction than large populations primarily because several processes that affect population dynamics operate differently in small populations than they do in large populations. These processes are deterministic density effects, environmental variation, genetic processes, demographic stochasticity, ecological feedback and catastrophes (McElhany et al., 2000).

Productivity: Population growth rate (productivity) and factors that affect population growth rate provide information on how well a population is "performing." These parameters, and related trends in abundance, reflect conditions that drive a population's dynamics and thus determine its abundance. Changes in environmental conditions, including ecological interactions, can influence a population's intrinsic productivity or the environment's capacity to support a population, or both. Such changes may result from random environmental variation over a wide range of temporal scales (environmental stochasticity) (McElhany et al. 2000). A population growth rate that is unstable or declining over a long period of time indicates poor resiliency to future environmental change (e.g., Lande 1993, Middleton and Nisbet 1997, Foley 1997).

Spatial distribution: Maintaining connectivity between genetic groups supports proper metapopulation function. Ensuring that populations are well represented across diverse habitats helps to maintain and enhance genetic variability and population resilience (McElhany et al., 2000). Additionally, ensuring wide geographic distribution across diverse climate and geographic regions helps to minimize risk from catastrophes (e.g., droughts, floods, hurricanes, etc.; McElhany et al., 2000).

Diversity: A robust population should maintain both genotypic and phenotypic diversity and have distributions that are spatially and temporally diverse. For example, diversity in reproductive strategies and timing, age structure, size, morphology, behavior, and genetics may protect a population from small-scale, catastrophic threats. Of these traits, some (such as DNA or protein sequence variation) are completely genetically based, whereas others (such as nearly all morphological, behavioral, and life-history traits) usually vary as a result of a combination of genetic and environmental factors.). Phenotypic diversity can be maintained by spatial and temporal variation in habitat characteristics.

In a spatially and temporally varying environment, there are three general reasons why diversity is important for species and population viability. First, diversity allows a species to use a wider array of environments than it could without it. For example, varying adult run and spawn timing allows several salmonid species to use a greater variety of spawning habitats than would be possible without this diversity. Second, diversity protects a species against short-term spatial and temporal changes in the environment. Fish with different characteristics have different likelihoods of persisting—depending on local environmental conditions. Therefore, the more diverse a population is, the more likely it is that some individuals would survive and reproduce in the face of environmental variation. Third, genetic diversity provides the raw material for surviving long-term environmental changes, such as cyclic or directional changes in freshwater, estuarine, and ocean

environments due to natural and human causes, and genetic diversity allows them to adapt to these changes (McElhany *et al*., 2000). It is important for the biologist (or Team) to consider and describe how diversity will be affected should portions of the range of the species be at moderate or high risk of extinction.

The biologist (or Team) should work through these four inter-related VP descriptors and explain how each is considered, what information is available for each, and how the conclusions are drawn regarding risk associated with each descriptor. Using this structured way of stepping through the descriptors that comprise demographic viability will foster uniformity and consistency in approach for status reviews and facilitate comparisons across species and regions. The approach should emphasize the consideration of the specific demographic risks faced by a species, both short-term and long-term, and also consider evolutionary potential (McElhany *et al*., 2000). **Appendix B** provides questions to consider when evaluating these descriptors, as well as several relevant modifying factors.

Threats analysis

Section 4(a)(1) of the ESA requires the agency to determine whether a species is endangered or threatened because of any of the following factors (or threats) alone or in combination:

1) destruction or modification of habitat;
2) overutilization for commercial, recreational, scientific, or educational purposes;
3) disease or predation;
4) inadequacy of existing regulatory mechanisms; or
5) other natural or human factors.

The demographic risk analysis described above is an assessment of the manifestation of past threats that have contributed to the species' current status and also informs the consideration of the biological response of the species to present and future threats. The biologist (or Team) will next organize and describe its assessment of threats according to the section 4(a)(1) factors listed above, including the impact of natural and anthropogenic disturbances (i.e., catastrophic events) (Bisson *et al*., 1997). Special attention should be paid to contemporary threats that have not manifested themselves in observed abundance, productivity, distribution, or diversity. To the extent possible, the biologist (or Team) will describe the links between demographic risks (as evaluated through the VP approach) and these threats. While the 4th section 4(a)(1) factor, "inadequacy of existing regulatory mechanisms," is a different type of factor, the impacts on the species resulting from the underlying unregulated or inadequately regulated threats should be evaluated in the same way as the other four factors. When a petition to delist a particular population is being considered, the biologist (or Team) should assess the potential impacts of threats assuming the species has no ESA protection (i.e., section 7 consultations, section 9 take prohibitions) in place because if the population were to be delisted, those protections would disappear and could not be relied upon.

Once the biologist (or Team) has discussed the VP descriptors and 4(a)(1) factors and explained, to the extent possible, their interactions and how the species is expected to respond to each threat factor, the biologist (or Team) may choose to evaluate the VP descriptors by scoring them from 1 to 5 ("very low," "low," "medium," "high," and "very high" risk) in terms of their contribution

to extinction risk. The use of scores is optional – it may be helpful in some circumstances, and it may unnecessarily complicate matters in other circumstances. If scoring these VP descriptors, the biologist (or Team) should consider how the past and current threats (section 4(a)(1) factors) have affected and how they are expected to continue to affect the species, individually and cumulatively. In doing this, the vulnerability to each threat and exposure of the species to each threat should be considered, and the species' biological response based on demographic factors should form the basis of the assessment. The scoring will be used by the biologist (or Team) to organize their assessment of each VP descriptor and how it may contribute to the extinction risk of the species. The biologist (or Team) may decide to score the threats affecting the species, too, though it is not necessary. See Appendix C (Qualitative Risk Analysis Tools and Expert Opinion) for an example of scoring for the demographic analysis (VP descriptors). Demographic risk or threats scores, if used, are not meant to translate directly to any particular level of overall extinction risk. In fact, the biologist (or Team) may choose not to score either demographic factors or threats, instead relying on an explanatory approach to evaluate them.

Ideally, the biologist (or Team) will have sufficient information to assess extinction risk based on both demographic and threats-based information; however, the extent to which this is possible depends on the quantity and quality of the available information. For example, in instances where the best available information pertains primarily to threats, the biologist (or Team) will describe the demographic risks that are expected to result from the particular threats, the likelihood of these demographic risks, and how these risks contribute to the overall risk of extinction.

2) Extinction Risk Assessment

After the biologist (or Team) has discussed best available information regarding the 4 VP descriptors and threats (ESA section 4(a)(1) factors) and evaluated them while considering interactions between VP descriptors and threats, the biologist (or Team) will synthesize the information to estimate the risk of extinction. The biologist (or Team) should evaluate the risk of extinction to the species qualitatively, using the categories "high," "moderate," or "low" to describe extinction risk and explaining their conclusions using a narrative approach. These categories are defined as:

> High risk: A species or DPS with a high risk of extinction is at or near a level of abundance, productivity, spatial structure, and/or diversity that places its continued persistence in question. The demographics of a species or DPS at such a high level of risk may be highly uncertain and strongly influenced by stochastic or depensatory processes. Similarly, a species or DPS may be at high risk of extinction if it faces clear and present threats (e.g., confinement to a small geographic area; imminent destruction, modification, or curtailment of its habitat; or disease epidemic) that are likely to create present and substantial demographic risks.
>
> Moderate risk: A species or DPS is at moderate risk of extinction if it is on a trajectory that puts it at a high level of extinction risk in the foreseeable future (see description of "High risk" above). A species or DPS may be at

> moderate risk of extinction due to projected threats or declining trends in abundance, productivity, spatial structure, or diversity. The appropriate time horizon for evaluating whether a species or DPS is more likely than not to be at high risk in the foreseeable future depends on various case- and species-specific factors. For example, the time horizon may reflect certain life history characteristics (e.g., long generation time or late age-at-maturity) and may also reflect the time frame or rate over which identified threats are likely to impact the biological status of the species or DPS (e.g., the rate of disease spread). (The appropriate time horizon is not limited to the period that status can be quantitatively modeled or predicted within predetermined limits of statistical confidence. The biologist (or Team) should, to the extent possible, clearly specify the time horizon over which it has confidence in evaluating moderate risk.)
>
> Low risk: A species or DPS is at low risk of extinction if it is not at moderate or high level of extinction risk (see "Moderate risk" and "High risk" above). A species or DPS may be at low risk of extinction if it is not facing threats that result in declining trends in abundance, productivity, spatial structure, or diversity. A species or DPS at low risk of extinction is likely to show stable or increasing trends in abundance and productivity with connected, diverse populations.

A direct and uniform translation between a biologist's (or Team's) extinction risk conclusions and a Region's (or F/PR's) listing determinations is not possible. In other words, if a species is at moderate risk of extinction, this does not necessarily mean the Region (or F/PR) will conclude that the species is a "threatened species." Prior to reaching a listing determination, the Region (or F/PR) must first evaluate ongoing conservation efforts of any state, foreign nation, or political subdivision thereof. 16 U.S.C. §1533(b)(1)(A).

When a Team is conducting the status review, it is sometimes a good idea for the Team to use an expert opinion-based assessment approach used by numerous NMFS Teams in previous status reviews (e.g., Pacific salmon, Southern Resident killer whale) to structure their thinking and express the associated level of uncertainty in assigning extinction risk to a species. See Appendix C (Qualitative Risk Analysis Tools and Expert Opinion) for details on this approach.

For some species petitioned for listing under the ESA, available data may be sufficient for conducting a reliable quantitative PVA or other quantitative extinction risk assessment. If adequate data and time exist, the biologist (or Team) may be able to model extinction risk at this stage, though a qualitative assessment as described above should always be conducted and may be the most appropriate for data-poor species. When doing a quantitative assessment, the risk of extinction or pseudo extinction should be estimated through the foreseeable future, and uncertainty parameters should be included in the estimates. No specific guidance is provided here for quantitative analysis because extinction risk models must be developed specifically for each species (though some software, such as RAMAS, exists that can be applied to different species when assumptions are satisfied). When a PVA will be used as the principal justification for a conclusion on extinction risk to a species, extra care should be given to clearly identify the

inputs to the model. Assumptions on inputs such as carrying capacity may result in significant differences in the outputs of such models.

Whichever approach is used to evaluate extinction risk, the biologist (or Team) must provide its conclusions in terms of "high," "moderate," or "low" extinction risk to the species and provide a thorough rationale for its conclusions. However, extinction risk analyses performed by the biologist (or Team), whether qualitative or quantitative, should not include the terms "Endangered" or "Threatened" or their verbatim ESA definitions.

3) Identifying Significant Portions of a Species' Range

As noted above under Section C, in the Definitions of "Endangered Species" and "Threatened Species," a portion of the range of a species will be considered "significant" if the species is not currently endangered or threatened throughout its range, but the portion's contribution to the viability of the species is so important that, without the members of that portion, the species would be in danger of extinction or likely to become so in the foreseeable future throughout its range.

If, after conducting the extinction risk analysis, the biologist (or Team) concludes that the species is at high or moderate risk of extinction throughout the species' range, then there is no need to conduct a SPOIR analysis as the species will likely be proposed for listing throughout its range. However, if the risk to the species throughout all of its range is low, then the biologist (or Team) will conduct a SPOIR analysis to determine if the species is at high or moderate risk of extinction in a SPOIR.

The SPOIR policy specifies that, in order to identify only those portions of the species' range that warrant further consideration, the agency must determine whether there is substantial information indicating that (1) the portions may be significant *and* (2) the species may be in danger of extinction in those portions or likely to become so within the foreseeable future. An affirmative answer to these questions is not a determination that the species is endangered or threatened throughout a significant portion of its range—rather, it is a preliminary step in determining whether a more detailed analysis is required to determine whether a species is threatened or endangered in a significant portion of its range. Listing a species based on the status of the species in a significant portion of its range is warranted only if the species is threatened or endangered in a portion of its range that is determined to be significant. The SPOIR policy further explains that, depending on the particular facts of each situation, it may be more efficient to address the significance issue first, but in other cases it will make more sense to examine the status of the species in the potentially significant portions first. Whichever question is asked first, an affirmative answer is required to proceed to the second question. If we determine that a portion of the range is not ''significant,'' we will not need to determine whether the species is endangered or threatened there; if we determine that the species is not endangered or threatened in a portion of its range, we will not need to determine if that portion is ''significant.'' Thus, if the answer to either question is negative, then the analysis concludes and listing is not warranted.

If the biologist (or Team) determines that a portion (or a combination of geographically separated portions) may be significant and that the species may be at high or medium risk of extinction in that portion and that addressing the significance issue first is the best approach, then the biologist (or Team) will evaluate the 4 VP descriptors (See Section II.C.1 *Description and Evaluation of Demographic Risks and Section 4(a)(1) Factors* above) to determine whether a portion of the range is significant. If the biologist (or Team) identifies a significant portion(s), under this option, the biologist (or Team) will then conduct an extinction risk analysis for the portion(s) to determine the risk of extinction of the species in that portion. The Region (or F/PR) will make the final determination on whether any significant portions are threatened or endangered.

If the biologist (or Team) determines that examining the extinction risk of the species in the potentially significant portion(s) should occur first, under this option, the biologist (or Team) will conduct an extinction risk analysis for the portion(s) and determine the risk of extinction in the portion(s). If the biologist (or Team) concludes that the portion(s) is at high or medium risk of extinction, the biologist (or Team) will then use the 4 VP descriptors as described below to evaluate whether the portion(s) of the range is/are significant. The Region (or F/PR) will make the final determination on whether any portion is significant.

<u>The 4 VP descriptors:</u>

Providing available information related to the 4 VP descriptors in the SPOIR analysis is the first step in documenting the rationale behind determining whether a portion is biologically significant. Because precise circumstances are likely to vary considerably from case to case, it is not possible to describe prospectively all the classes of information that might bear on the biological significance of a portion of the range of a species. Therefore, the information that determines whether a portion of a range is significant may include, but is not limited to, the concepts discussed here. With respect to a SPOIR, the following are some questions that may be considered in determining whether any portions are so important that their loss would result in the remainder of the species being at moderate or high risk of extinction, because of VP descriptor-related issues.

Abundance:

- Without that portion, would the level of abundance of the remainder of the species cause the species to be at moderate or high risk of extinction due to environmental variation or anthropogenic perturbations (of the patterns and magnitudes observed in the past and expected in the future)?
- Without that portion, would the abundance of the remainder of the species be so low, or variability in abundance so high, that it would be at moderate or high risk of extinction due to depensatory processes?
- Without that portion, would abundance of the remainder of the species be so low that its genetic diversity would be at risk due to inbreeding depression, loss of genetic variation, or fixation of deleterious alleles?

- Without that portion, would abundance of the remainder of the species be so low that it would be at moderate or high risk of extinction due to its inability to provide important ecological functions throughout its life-cycle?
- Without that portion, would the abundance of the remainder of the species be so low that it would be at risk due to demographic stochasticity?

Productivity:

- Without that portion, would the average population growth rate of the remainder of the species be below replacement such that it would be at moderate or high risk of satisfying the abundance conditions described above?
- Without that portion, would the average population growth rate of the remainder of the species be below replacement such that it is unable to exploit requisite habitats/niches/etc. or at risk due to depensatory processes during any life-history stage?
- Without that portion, would the remainder of the species exhibit trends or shifts in demographic or reproductive traits that portend declines in the per capita growth rate, which pose a risk of satisfying any of the preceding conditions?

Spatial distribution:

- Will the loss of one or more of the portions significantly increase the risk of extinction to the species as a whole by making the species more vulnerable to catastrophic events such as storms, disease or temperature anomalies?
- Will connectivity between portions of the species' range be maintained if a portion is lost (e.g., does the loss of one portion of the range of the species create isolated groups or populations?)?
- Are there particular habitat types that the species occupies that are only found in certain portions of the species' range? If so, would these habitat types be accessible if a portion or portions of the range of the species are lost?
- Are threats to the species concentrated in particular portions of the species' range and if so, do these threats pose an increased risk of extinction to those portions' persistence?

Diversity:

- Will unique genetic diversity be lost if a portion of the range of the species is lost?
- Does the loss of this genetic diversity pose an increased risk of extinction to the species?

See **Appendix D: *Examples of Significant Portion of its Range Analyses*.**

D. Documenting Conclusions in a Status Review Report

When a Status Review Report is prepared the essential deliverable product is the review and analysis of the best available scientific and commercial information on the species. The biologist (or Team) should provide a detailed description of methods for any risk analysis that was conducted, including evaluations of risk based on the 4 VP descriptors and section 4(a)(1) factors, any quantitative or qualitative estimates of overall extinction risk for the species, and the

relative contribution of identified demographic risks and threats to the overall assessed level of extinction risk. The Status Review Report should provide a detailed documentation of the evaluation process used, explicitly describing assumptions, uncertainties, and where best professional judgment was applied.

It is important to identify the types of uncertainties the biologist (or Team) incorporated into the analysis and explain how they were dealt with. Types of uncertainties include linguistic, epistemic, and aleatory. Linguistic uncertainty takes the form of vagueness, ambiguity, or under-specificity in language. If a biologist (or Team) uses resources that contain linguistic uncertainty to inform their assessment, he/she or they should explicitly note how they have interpreted any vague or ambiguous language that may have influenced their assessment of extinction risk. Epistemic uncertainty includes statistical uncertainty, observational error, or structural uncertainty (uncertainty about a model itself and how well it represents reality). Resources used to inform the biologist (or Team's) assessment of extinction risk or the assessment itself may contain these types of uncertainty; the biologist (or Team) should acknowledge the uncertainty and explain any associated assumptions that were made. Linguistic and epistemic uncertainties are considered reducible forms of uncertainty because they can be reduced through clarification of language, or further study over time. Aleatory uncertainty, however, is considered irreducible and includes uncertainty associated with environmental stochasticity, demographic stochasticity, and other projections of future conditions (Romito *et al*. 2015). The biologist (or Team) should again acknowledge these uncertainties and explain any associated assumptions that were made.

If a biologist (or Team) applies Risk Analysis tools such as distributing likelihood points among different categories of extinction risk, it is imperative that the biologist or Team's conclusions are accompanied with a robust explanatory narrative. This narrative must provide sufficient information for decision makers to fully understand how the above uncertainties and other considerations informed the biologist (or Team's) conclusions. The accompanying narrative should include:

- A description of the instructions given the biologist (or Team) for applying the Risk Analysis tools used for the overall extinction risk analysis. This should include a description of how the biologist (or Team) was instructed to incorporate uncertainty in assessing risk.
- Clear definitions of the terms and standards applied in the biologist's (or Team's) extinction risk assessment.
- A transparent discussion of the explicit and implicit assumptions in the biologist's (or Team's) technical analyses, as well as any judgements based on expert opinion.
- Description of information gaps or key unknowns.
- Explanation of the key uncertainties (e.g., linguistic, epistemic, and aleatory).
- A description of the information relied upon, underscoring the information that most strongly influenced the biologist's (or Team's) conclusions.
- A discussion of possible alternative interpretations or conclusions, including an articulation of any minority opinions expressed on the Team (when a Team is involved).
- A discussion – in light of uncertainties, unknowns, and assumptions – of the biologist's (or Team's) confidence in the overall conclusions.

The Status Review Report will also include a list of references used in completing it, including personal communications and "gray literature,"[12] as well as a list of primary individuals contacted. Personal communications that are included as references must be documented in a memorandum to the file or similar documentation and provided to the Region and/or F/PR in order to be included in the docket. Gray literature included as references must be provided to the Region and/or F/PR, along with a written explanation why the gray literature is reliable under the circumstances to be included in the decision file. In some circumstances, site-specific location information on species presence should be attached as a separate appendix so this information can be easily removed to protect listed plants or animals from being taken or collected.

The biologist (or Team) will not use the statutory terms "endangered" or "threatened" or their definitions when making conclusions regarding the species' risk of extinction, because the ultimate determination of a species' proposed status reflects consideration of the benefits of ongoing conservation efforts that are assessed apart from the Status Review Report. The use of policy judgment is inherent in the determination of what constitutes the best available scientific information (e.g., how much uncertainty is acceptable and how to weight competing information), and the ultimate decision is made by the agency, not the biologist (or Team). To make this clear to the public, a disclaimer will be included near the front of all Status Review Reports that states the following: "This document does not represent a decision by NMFS on whether this taxon should be proposed for listing as threatened or endangered under the Endangered Species Act."

It is NMFS' policy and practice to seek peer review of the scientific information underlying our Section 4 determinations, which includes: (1) status review reports, where they have been prepared, informing proposed listing determinations; and (2) biological reports and economic analyses informing critical habitat designations. Where there is no separate status review report, it is appropriate to circulate the final listing determination (including negative determinations) or proposed rule for peer review in *lieu* of such a report, so long as either the agency's ultimate conclusions are removed from the document first or it is made clear that peer reviewers' opinions are sought only on the underlying scientific information.

In prior versions of this status review guidance, we suggested that peer review should be sought both on the underlying status review report as well as a proposed listing rule. However, we now clarify that only one round of peer review is necessary. Peer review of the scientific and commercial information upon which we are basing our listing determination is informed by the requirements of a bulletin issued by the White House Office of Management and Budget in 2004. *See* Memorandum for Heads of Departments and Agencies M-05-03: "Issuance of OMB's 'Final Information Quality Bulletin for Peer Review'" (Dec. 16, 2004) and attachment ("Final Information Quality Bulletin for Peer Review");[13] NMFS Policy Directive PD 04-108-4, "OMB

[12] Gray literature refers to information that falls outside the mainstream of published journal and monograph literature, not controlled by commercial publishers. It includes hard-to-find studies, reports, or dissertations, conference abstracts, or papers.

[13] https://www.whitehouse.gov/sites/default/files/omb/memoranda/fy2005/m05-03.pdf. The Bulletin was issued under authority of the Information Quality Act, Pub. L. 106-554, § 515, and other authorities.

Peer Review Bulletin Guidance" (June 2012).[14] The OMB Bulletin addresses a number of issues regarding the conduct of peer review for "influential scientific information."[15] It affords significant flexibility to agencies to determine the manner of seeking peer review of influential scientific information. Among other things, the Bulletin notes that peer review should be sought only on the underlying scientific information, not on the policy determinations of the agency. It also notes that an agency may decide that seeking peer review *prior* to publication of a proposed rule for public comment is preferable, in that it helps ensure that what the public is asked to comment upon is not likely to change in response to peer review comments on the underlying information.

Ten years earlier, in 1994, we had adopted a joint policy with the United States Fish and Wildlife Service outlining our plans at that time for seeking peer review in connection with ESA management activities. *See* "Interagency Cooperative Policy for Peer Review in ESA Activities," 59 FR 34270 (July 1, 1994) (the "Joint Peer Review Policy"). The joint policy indicated that the Services would "[s]olicit the expert opinions of three appropriate and independent specialists regarding pertinent scientific or commercial data and assumptions relating to the taxonomy, population models, and supportive biological and ecological information for species under consideration for listing." The policy anticipated that this would be done simultaneously with seeking public comment on the proposed listing rule. However, in light of the subsequent guidance in the OMB Bulletin and our practice of submitting the scientific information underlying our rules for peer review, we have concluded that a separate peer review process on a proposed rule during the comment period is not required.

Each region has an appointed IQA Coordinator; these coordinators may be consulted if there are questions regarding application of the OMB Peer Review Bulletin. Peer reviewers should clearly understand that they are reviewing a draft document that is not intended for further distribution. The following disclaimer should be included in the report: "THIS INFORMATION IS DISTRIBUTED SOLELY FOR THE PURPOSE OF PREDISSEMINATION PEER REVIEW UNDER APPLICABLE INFORMATION QUALITY GUIDELINES. IT HAS NOT BEEN FORMALLY DISSEMINATED BY [THE AGENCY]. IT DOES NOT REPRESENT AND SHOULD NOT BE CONSTRUED TO REPRESENT ANY AGENCY DETERMINATION OR POLICY." In cases where the information is highly relevant to specific policy or regulatory deliberations, this disclaimer shall appear on each page of a draft report or scientific document. The biologist (or Team) subsequently revises the report to incorporate comments as appropriate, including an explanation in the peer review report in those instances where they disagree with the peer review comments.

III. Developing a Recommended ESA Listing Determination

[14] http://www.cio.noaa.gov/services_programs/pdfs/04-108-4_PRB_Guidance_approved_with_cover.pdf. Both the OMB Bulletin and the NMFS directive specify certain requirements, such as that a disclaimer be included in the pre-dissemination copies of scientific information sent out for peer review. The NMFS directive also requires that a certification be included in the administrative record for actions that rely on influential scientific information explaining how peer review was conducted.

[15] "Influential scientific information" is defined in the Bulletin as information that we can reasonably determine will have or does have a clear and substantial impact on important public policies.

The Region (or F/PR) will review the Status Review Report's information and conclusions on extinction risk, consider conservation efforts as required under Section 4(b)(1)(A), and determine the status of the species. If the Region (or F/PR) determines that a species is endangered or threatened throughout its range, then it must recommend to the AA that the species be listed as endangered or threatened. Any vertebrate population (or set of populations) in a significant portion of the range that is determined to be endangered or threatened must be evaluated under the DPS policy criteria to determine if the population coincides with the boundaries of a DPS, so in these cases, the Region (or F/PR) will ask the biologist (or Team) to evaluate whether that vertebrate population (or populations) meets the DPS policy criteria. If that population (or populations) coincides with the boundaries of a DPS, then only the DPS would be listed (See the final policy on the interpretation of "significant portion of its range" for further details (79 FR 37578; July 1, 2014)). While in many cases the biologist (or Team) may identify DPSs first, then evaluate the status throughout the DPS, and then conduct a SPOIR analysis of the DPS, there may be cases where, after conducting an SPOIR analysis, the boundaries of an SPOIR that is at high or medium risk of extinction will coincide with the boundaries of a DPS identified at a different hierarchical level (DPSs can be identified at different hierarchical levels).

As required by the ESA, a listing determination must be based solely on the best scientific and commercial data available and is reached after conducting a review of the status of the species and after taking into account those efforts, if any, being made to protect such species. After the collective body of information developed and analyzed in the preceding steps is compiled (Status Review Report), the Region (or F/PR) synthesizes the information and for species that are potentially endangered or threatened, evaluates conservation efforts (both ongoing and new/unproven) to determine whether they ameliorate any threats to the species. For conservation efforts that have been implemented for a sufficient period to show the likely effects on the species, the Region (or F/PR) can evaluate them to determine whether their implementation results in the species not being endangered or threatened, or whether their implementation results in the species being threatened instead of endangered. While the biologist (or Team) is not asked to evaluate conservation efforts, if conservation efforts were considered by the biologist (or Team) in making extinction risk conclusions, then the Region (or F/PR) should take this into consideration.

For domestic, formalized conservation efforts (e.g., management plans, conservation plans, regulatory mechanisms) that have yet to be implemented or that have yet to demonstrate their effectiveness, the agencies apply the joint NMFS/USFWS Policy for the Evaluation of Conservation Efforts when Making Listing Decisions (PECE; http://www.nmfs.noaa.gov/pr/pdfs/fr/fr68-15100.pdf) to evaluate the certainty that these conservation efforts will be implemented and will be effective before determining whether they make it unnecessary to list a species, or whether the agencies should list a species as threatened rather than endangered (68 FR 15100; March 28, 2003). The consideration of future or not yet proven protective efforts requires an evaluation of the probability that the efforts will be implemented and effective, necessitating consideration of policy and management issues such as the likelihood of future funding and future local agency involvement. The PECE analysis must articulate the relationship between the conservation efforts and the removal of a threat. Documentation of the PECE analysis should include a description of related uncertainties,

assumptions, and the potential consequences of different future management scenarios (the Region may ask the biologist (or Team) to evaluate the effects of different future management scenarios in order to have the information it needs). The inadequacy of *existing* regulatory measures (the 4th section 4(a)(1) factor, included above in Section II.C.1) is not part of the PECE analysis. Rather, the impacts of this factor should already be reflected in the status of the species. Note that foreign conservation efforts are evaluated directly under Section 4(b)(1)(A) rather than the specific criteria of the PECE Policy.

At this point in the review, it is necessary to integrate the species' extinction risk, threats, protective efforts, and uncertainty. Once the Region (or F/PR) decides on the appropriate listing status for the species, the Region or F/PR prepares a recommendation for the RA or F/PR Director regarding the appropriate course of action for the listing decision. This is in the form of a 12-month finding, for publication in the *Federal Register*, and includes a summary of the Status Review Report, the consideration of conservation efforts or PECE analysis, and the rationale for determining whether a species is endangered or threatened. If the recommendation is to list a species as threatened or endangered, the *Federal Register* notice will also include a proposed rule to list the species. It is critical in this step to document clearly how the conclusion regarding a species' ESA status was reached. Agency staff members also prepare a Decision Memorandum from the RA to the Assistant Administrator for Fisheries (AA), summarizing briefly the conclusions of the Status Review Report and the rationale for the listing determination.

The RA or F/PR Director reviews the regional or F/PR staff's recommendation and signs the Decision Memorandum to the AA if he or she concurs with staff's recommendation that (1) the species should be listed as endangered, *i.e.*, is in danger of extinction throughout all or a significant portion of its range; (2) the species should be listed as threatened, *i.e.*, is likely to become endangered throughout all or a significant portion of its range in the foreseeable future; or (3) listing is not warranted. If the species occurs in more than one region, the RA of the lead region (or F/PR) contacts and seeks concurrence from RAs of other regions within the range of the species. The RA or F/PR also: (1) recommends critical habitat for designation; (2) requests a 1-year extension for final designation of critical habitat when it is not determinable at the time of listing; or (3) recommends that the designation of critical habitat is not prudent. If critical habitat is being recommended for designation, an economic impact analysis must accompany the recommendation. Unlike endangered species, the take prohibitions of section 9(a) do not automatically apply to threatened species; therefore, if the species is being recommended for listing as threatened, the RA or F/PR recommends to the AA whether protective regulations should be issued under section 4(d), either at this time or under a separate rule.

The RA transmits the signed Decision Memo to F/PR, accompanied by a draft *Federal Register* notice (and, for critical habitat designations, an economic impact analysis and a section 4(b)(2) report; and, for certain 4(d) protective rules, an economic analysis and a National Environmental Policy Act (NEPA) analysis) and other supporting documents, such as a signed attorney certification form (with the concurrence of any other RAs within the species' range) (see intranet checklist (Proposed ESA Listing/Critical Habitat/4(d)/10(j) Rules and 90-day findings - Regional Office)). F/PR reviews the recommendation and supporting documents and discusses any outstanding issues that need resolution with the region. Then F/PR recommends and transmits

the package for review and clearance by the AA, Chief Counsel for Regulations at the Department of Commerce, and NOAA General Counsel and Policy Office (if deemed controversial), and ultimately for signature by the AA and publication in the *Federal Register*. If F/PR has led the status review, the F/PR Director signs the Decision Memo and transmits it with other supporting documents for review and clearance by the AA, Chief Counsel for Regulations at the Department of Commerce, and, for actions that NOAA General Counsel determines to be controversial, NOAA General Counsel and Policy Office, and ultimately for signature by the AA and publication in the *Federal Register*.

If the species is proposed for listing under the ESA, the Regional Office will review all public comments submitted during the comment period and determine whether to publish a final rule in the *Federal Register* to list the species as threatened or endangered. The region will draft a *Federal Register* notice that responds to the comments and make the final rule recommendation, and again, F/PR Headquarters will review this determination before making a final recommendation to the AA. Such a final determination is due one year from the date of the proposed rule.

If the region or F/PR determines that listing is not warranted, then it will publish a "negative" 12-month finding in the *Federal Register*.

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Appendix A: *Boilerplate Language for Preamble of 90-day Findings on Petitions to List*

ESA Statutory, Regulatory, and Policy Provisions and Evaluation Framework

Section 4(b)(3)(A) of the ESA of 1973, as amended (16 U.S.C. 1531 *et seq*.), requires, to the maximum extent practicable, that within 90 days of receipt of a petition to list a species as threatened or endangered, the Secretary of Commerce make a finding on whether that petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted, and to promptly publish such finding in the Federal Register (16 U.S.C. 1533(b)(3)(A)). When it is found that substantial scientific or commercial information in a petition indicates the petitioned action may be warranted (a ''positive 90-day finding''), we are required to promptly commence a review of the status of the species concerned during which we will conduct a comprehensive review of the best available scientific and commercial information. In such cases, we conclude the review with a finding as to whether, in fact, the petitioned action is warranted within 12 months of receipt of the petition. Because the finding at the 12-month stage is based on a more thorough review of the available information, as compared to the narrow scope of review at the 90-day stage, a ''may be warranted'' finding does not prejudge the outcome of the status review.

Under the ESA, a listing determination may address a species, which is defined to also include subspecies and, for any vertebrate species, any DPS that interbreeds when mature (16 U.S.C. 1532(16)). A joint NMFS–U.S. Fish and Wildlife Service (USFWS) (jointly, ''the Services'') policy clarifies the agencies' interpretation of the phrase ''distinct population segment'' for the purposes of listing, delisting, and reclassifying a species under the ESA (61 FR 4722; February 7, 1996). A species, subspecies, or DPS is ''endangered'' if it is in danger of extinction throughout all or a significant portion of its range, and ''threatened'' if it is likely to become endangered within the foreseeable future throughout all or a significant portion of its range (ESA sections 3(6) and 3(20), respectively, 16 U.S.C. 1532(6) and (20)). Pursuant to the ESA and our implementing regulations, we determine whether species are threatened or endangered based on any one or a combination of the following five section 4(a)(1) factors: the present or threatened destruction, modification, or curtailment of habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; inadequacy of existing regulatory mechanisms; and any other natural or manmade factors affecting the species' existence (16 U.S.C. 1533(a)(1), 50 CFR 424.11(c)).

ESA-implementing regulations issued jointly by NMFS and USFWS (50 CFR 424.14(b)) define ''substantial information'' in the context of reviewing a petition to list, delist, or reclassify a species as the amount of information that would lead a reasonable person to believe that the measure proposed in the petition may be warranted. In evaluating whether substantial information is contained in a petition, the Secretary must consider whether the petition: (1) Clearly indicates the administrative measure recommended and gives the scientific and any common name of the species involved; (2) contains detailed narrative justification for the recommended measure, describing, based on available information, past and present numbers and distribution of the species involved and any threats faced by the species; (3) provides information regarding the status of the species over all or a significant portion of its range; and (4) is accompanied by the appropriate supporting documentation in the form of bibliographic

references, reprints of pertinent publications, copies of reports or letters from authorities, and maps (50 CFR 424.14(b)(2)).

At the 90-day finding stage, we evaluate the petitioners' request based upon the information in the petition including its references and the information readily available in our files. We do not conduct additional research, and we do not solicit information from parties outside the agency to help us in evaluating the petition. We will accept the petitioners' sources and characterizations of the information presented if they appear to be based on accepted scientific principles, unless we have specific information in our files that indicates the petition's information is incorrect, unreliable, obsolete, or otherwise irrelevant to the requested action. Information that is susceptible to more than one interpretation or that is contradicted by other available information will not be dismissed at the 90-day finding stage, so long as it is reliable and a reasonable person would conclude it supports the petitioners' assertions. In other words, conclusive information indicating the species may meet the ESA's requirements for listing is not required to make a positive 90- day finding. We will not conclude that a lack of specific information alone necessitates a negative 90-day finding if a reasonable person would conclude that the unknown information itself suggests the species may be at risk of extinction presently or within the foreseeable future.

To make a 90-day finding on a petition to list a species, we evaluate whether the petition presents substantial scientific or commercial information indicating the subject species may be either threatened or endangered, as defined by the ESA. First, we evaluate whether the information presented in the petition, along with the information readily available in our files, indicates that the petitioned entity constitutes a ''species'' eligible for listing under the ESA. Next, we evaluate whether the information indicates that the species faces an extinction risk that is cause for concern; this may be indicated in information expressly discussing the species' status and trends, or in information describing impacts and threats to the species. We evaluate any information on specific demographic factors pertinent to evaluating extinction risk for the species (e.g., population abundance and trends, productivity, spatial structure, age structure, sex ratio, diversity, current and historical range, habitat integrity or fragmentation), and the potential contribution of identified demographic risks to extinction risk for the species. We then evaluate the potential links between these demographic risks and the causative impacts and threats identified in section 4(a)(1).

Information presented on impacts or threats should be specific to the species and should reasonably suggest that one or more of these factors may be operative threats that act or have acted on the species to the point that it may warrant protection under the ESA. Broad statements about generalized threats to the species, or identification of factors that could negatively impact a species, do not constitute substantial information indicating that listing may be warranted. We look for information indicating that not only is the particular species exposed to a factor, but that the species may be responding in a negative fashion; then we assess the potential significance of that negative response.

Many petitions identify risk classifications made by nongovernmental organizations, such as the International Union on the Conservation of Nature (IUCN), the American Fisheries Society, or NatureServe, as evidence of extinction risk for a species. Risk classifications by such

organizations or made under other Federal or state statutes may be informative, but such classification alone will not alone provide sufficient basis for a positive 90-day finding under the ESA. For example, as explained by NatureServe, their assessments of a species' conservation status do ''not constitute a recommendation by NatureServe for listing under the U.S. Endangered Species Act'' because NatureServe assessments ''have different criteria, evidence requirements, purposes and taxonomic coverage than government lists of endangered and threatened species, and therefore these two types of lists should not be expected to coincide'' (http://www.natureserve.org/prodServices/pdf/NatureServeStatusAssessmentsListing-Dec%202008.pdf). Additionally, species classifications under IUCN and the ESA are not equivalent; data standards, criteria used to evaluate species, and treatment of uncertainty are also not necessarily the same. Thus, when a petition cites such classifications, we will evaluate the source of information that the classification is based upon in light of the standards on extinction risk and impacts or threats discussed above.

Appendix B: *General Conceptual Guidance for Evaluating Extinction Risk*

Questions to Consider in Evaluating a Species' Level of Extinction Risk

Threats to a species' long-term persistence are manifested demographically as risks to its abundance, population growth rate, spatial structure and connectivity, and genetic and ecological diversity. These demographic risks thus provide the most direct indices or proxies of extinction risk. A species at very low levels of abundance and with few populations will be less tolerant to environmental variation, catastrophic events, genetic processes, demographic stochasticity, ecological interactions, and other processes (e.g., Meffe and Carroll 1994, Caughley and Gunn 1996). A population growth rate that is unstable or declining over a long period of time indicates poor resiliency to future environmental change (e.g., Lande 1993, Middleton and Nisbet 1997, Foley 1997). A species that is not widely distributed across a variety of well-connected habitats is at increased risk of extinction due to environmental perturbations, including catastrophic events (Schlosser and Angermeier 1995, Hanski and Gilpin 1997, Tilman and Lehman 1997, Cooper and Mangel 1999). A species that has lost locally adapted genetic and ecological diversity may lack the raw resources necessary to exploit a wide array of environments and endure short- and long-term environmental changes (e.g., Groot and Margolis 1991, Wood 1995). Assessing extinction risk of a species involves evaluating whether risks to its abundance, population growth rate, spatial structure and or diversity are such that it is at or near an extinction threshold, or likely to become so in the foreseeable future.

The following considerations, adapted from McElhany et al. (2000), provide some general guidance for evaluating a species' extinction risk in terms of its population abundance and trends, productivity, spatial structure, age structure, sex ratio, diversity, current and historical range, and habitat integrity or fragmentation.

Questions for Evaluating a Species Extinction Risk

A. Abundance Questions

1.	**Is the species' abundance so low that it is at risk of extinction due to environmental variation or anthropogenic perturbations (of the patterns and magnitudes observed in the past and expected in the future)?** Environmental variation includes fluctuations in environmental and oceanographic conditions (such as oceanographic regime shifts and El Niño events), local disturbances (natural and anthropogenic), and environmental catastrophes. Anthropogenic perturbations include any human activity that directly or indirectly poses demographic risks to the species.
2.	**Is the species' abundance so low, or variability in abundance so high, that it is at risk of extinction due to depensatory processes?** Very low levels of species abundance and density may be insufficient to support mate choice, sex-ratios, fertilization and recruitment success, reproductive or courting behaviors, foraging success, and predator avoidance behaviors. A species exhibiting high variability in abundance and/or population growth rate may also experience strong depensatory risks at low points in its variability.
3.	**Is the species' abundance so low that its genetic diversity is at risk due to inbreeding depression, loss of genetic variants, or fixation of deleterious mutations?**
4.	**Is a species' abundance so low that it is at risk of extinction due to its inability to provide important ecological functions throughout its life-cycle?** Organisms may modify both their physical and biological environments in various ways throughout their life-cycle. Inability to affect these modifications can limit population production, and degrade habitat conditions for other organisms as a whole. The abundance levels required for these effects depend largely on the local habitat structure and particular species' biology.
5.	**Is a species' abundance so low that it is at risk due to demographic stochasticity?** Demographic stochasticity refers to the seemingly random effects of variation in individual survival or fecundity that are most easily observed in small populations. As species' abundance declines, the relative influences of environmental variation and demographic stochasticity change – with the latter coming to dominate.
6.	**Species status evaluations should take uncertainty regarding abundance into account.** Abundance estimates always contain observational error, and this should be taken into account with deference to the species. Additionally, short-lived species with wide inter-annual variations in abundance contribute to uncertainty about average abundance and trends. For these reasons, it would not be prudent to base an assessment of risk to a species' abundance on a single high or low observation. Depending on the circumstances, a species may be considered to be at risk if it satisfied the above conditions on average over a short period of time.

B. Population Growth Rate Questions

1.	**Is a species' average population growth rate below replacement and such that it is at risk of satisfying the abundance conditions described above?**

2.	**Is the species' average population growth rate below replacement and such that it is unable to exploit requisite habitats/niches/etc. or at risk due to depensatory processes during any life-history stage?** Very low levels of species population growth rate may be insufficient to support mate choice, sex-ratios, fertilization and recruitment success, reproductive or courting behaviors, foraging success, and predator avoidance behaviors.
4.	**Does the species exhibit trends or shifts in demographic or reproductive traits that portend declines in per capita growth rate which pose risk of satisfying any of the preceding conditions?** Changes in metrics, such as average size of mature individuals or average fecundity, that affect the instantaneous per capita growth rate are often more easily and precisely quantified than are changes in abundance, and may provide a more direct indication of declining growth rate.
5.	**Species status evaluations should take into account uncertainty in estimates of growth rate and population growth rate-related parameters.** To estimate long-term trends it is important to have an adequate time series. Unfortunately, such time series, when they exist at all, are often short, contain large observational errors, and/or exhibit gaps in observation. These constraints may greatly limit the power of statistical analyses to detect ecologically significant trends before substantial changes in abundance or distribution have occurred.

C. Spatial Structure Questions

1.	**Are habitat patches being destroyed faster than they are naturally created such that the species is at risk of extinction due to environmental and anthropogenic perturbations or catastrophic events?** With habitat being continually created and destroyed by natural processes, human activities should not severely reduce the area of distribution, or the number of habitat patches. Strong negative trends in the amount of available habitat deterministically increase extinction risk, although the relationship between decreasing the number/size of patches and extinction risk is not necessarily linear.
2.	**Are natural rates of dispersal among populations, metapopulations, or habitat patches so low that the species is at risk of extinction due to insufficient genetic exchange among populations, or an inability to find or exploit available resource patches?**
3.	**Is the species at risk of extinction due to the loss of critical source populations, subpopulations, or habitat patches?** Some populations, subpopulations, and habitat patches are naturally more productive than others. In fact, a few patches may operate as highly productive sources for several sinks that are not self-sustaining. Although potentially representing only a small fraction of the species' total distribution, declines in abundance or population growth rate of source populations may portend drastic declines for the species as a whole. However, it should be recognized that spatial processes are dynamic, and specific source and sink populations may exchange roles over time.
4.	**Analyses of species' spatial processes should take uncertainty into account.** Often, little information is available on how spatial processes relate to a species' extinction risk. As a default, it should be assumed that historical spatial processes and population structure were sustainable, but it is uncertain whether novel population structure will be.

D. Diversity Questions

The loss of diversity can reduce a species' reproductive fitness, fecundity, and survival, thereby contributing to declines in abundance and population growth rate and increasing extinction risk (e.g., Gilpin and Soulé 1986). *There is some uncertainty, however, whether the loss of diversity by itself confers a risk of extinction (see Brook et al. 2002). Although the loss of diversity certainly increases extinction risk through its compounding effects on other demographic factors, it is argued by some that the loss of diversity by itself plays a relatively minor role in extinctions. The loss of diversity can help bring species to a high risk status, but other demographic or environmental factors usually play the direct role in causing extinctions (Lande 1988, Caro and Laurenson 1994, Caughley 1994, Dobson 1999). In general, risks to a species' diversity are most pertinent to the consideration of whether it is likely to become an endangered species throughout all or a significant portion of its range (i.e., whether the species is threatened).*

1.	**Is the species at risk due to a substantial change or loss of variation in life-history traits, population demography, morphology, behavior, or genetic characteristics?** Many of these traits may be adaptations to local conditions, or they may help protect populations against environmental variability. A mixture of genetic and environmental factors usually causes phenotypic diversity, and the substantial loss of phenotypic diversity may indicate **elevated** risk even if current genetic techniques or data are unable to resolve a genetic basis.
2.	**Is the species at risk because natural processes of dispersal, migration, and/or gene flow among populations have been significantly altered?**
3.	**Is the species at risk because natural processes that cause ecological variation have been significantly altered?** Phenotypic diversity can be maintained by spatial and temporal variation in habitat characteristics. Processes that promote ecological diversity, including natural habitat disturbance regimes and factors that maintain habitat patches of sufficient quality, should not be significantly altered.
4.	**Species status evaluation should take uncertainty about requisite levels of diversity into account.** Our understanding of the role that diversity plays in species viability is limited. The historical representation of phenotypic diversity serves as a useful "default" guideline for evaluating species status.

E. Relevant Modifying Factors

The following are some relevant modifying factors that should be considered on a species-by-species basis in extinction risk evaluations, in the context of a species' unique life-history constraints (Mace et al., 2002). These factors may impact a species' resilience or vulnerability to particular threats, and will influence the magnitude and rate of declines in abundance and/or spatial distribution deemed critical for a species.

1.	**Life-History Characteristics** Low instantaneous per-capita rate of increase, r Slow growth Late maturation Long life-span Low fecundity Shifts in sex ratios with size and/or age Low effective population size Broadcast spawning and density thresholds for successful fertilization Low, infrequent recruitment

2.	**Population Characteristics** Low population density Limited dispersal Limited migration Strong depensatory or Allee effects
3.	**Habitat Constraints** Habitat specificity or site fidelity Low physiographic tolerance Habitat sensitivity Close species associations Strong ecological interactions (competition, parasitism, predation) Ontogenetic shifts in habitat Endemism, rarity, geographic extent
4.	**Specific Threats** Disease High rates of direct and/or indirect take Extreme commercial value

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Appendix C: *Qualitative Risk Analysis Tools and Expert Opinion*

This appendix provides a brief overview of the purpose of structured expert opinion, an explanation of an expert opinion approach often used by Teams, an illustration to show how it can be used in a status review, and an annotated bibliography for further guidance.

The entire process of responding to a listing petition and making a listing determination may or may not be conducted with the use of Structured Decision Making (SDM) or Risk Analysis. However, the fields of SDM and Risk Analysis offer valuable tools that may be of use for the status review portion of the overall process. Structured Decision Making is a process designed to lead decision makers through a transparent and step-wise procedure to decide what action to take to meet specific objectives. While a species status review itself is not a decision making document (in fact, Status Review Teams are not charged with making recommendations regarding the species' particular listing status, as distinct from assessing their risk of extinction as a factual matter), a status review represents the risk analysis portion of the overall decision making process with regard to ESA listing decisions, and provides vital information on which a final (or proposed) decision will be based. Where a Team is convened to conduct the Status Review, we recommend that tools derived from the fields of SDM and Risk Analysis be used when it is necessary to reach decisions that incorporate expert opinion. These decisions can include identifying DPSs, when requested by the Region (or F/PR), or determining extinction risk. Specifically, Structured Expert Opinion (DeMaster et al. 2004) and Expert Opinion as applied in Probabilistic Risk Analysis (See Chapter 10 in Bedford and Cooke, 2001) are examples of appropriate methodologies for a Status Review Team. The decision making process should be based on clearly articulated fundamental assumptions, deal explicitly with uncertainty, and respond transparently to legal mandates.

The purpose of decision structuring is to provide a rational, thorough, and transparent decision, the basis for which is clear to both the decision maker(s) and to other observers, and to provide a means to capture uncertainty in the decision(s). Use of qualitative risk analysis and structured expert opinion methods allows for a rigorous decision-making process, the defensible use of expert opinion, and a well-documented record of how a decision was made. These tools also accommodate limitations in human understanding and allow for problem solving in complex situations. Risk analysis and other structured processes require uncertainty to be dealt with explicitly and biases controlled for. The information used may be empirical data, or it may come from subjective rankings or expert opinion expressed in explicit terms. Even in cases where data are sufficient to allow a quantitative analysis, the structuring process is important to clearly link outcomes and decision standards, and thereby reveal the reasoning behind the decision.

By definition expert opinion is subjective, so results usually will not be precisely repeatable. Expert opinion approaches are limited by lack of knowledge and susceptible to personal and institutional biases. In application, expert opinion approaches often involve challenges of working with strong personalities and facing non-biological concerns that technically should not be part of species risk analysis. Selection of appropriate experts is critical to the development of appropriate listing determinations. To aid decision makers, participants in such processes must exhibit expert professional judgment in addition to expert knowledge (DeMaster *et al*., 2004).

An expert opinion-based approach to extinction risk assessment often used by Teams is the "likelihood point method," often referred to as the "FEMAT method" because it is a variation of a method used by scientific teams evaluating management options under the Northwest Forest Plan (Forest Ecosystem Management and Assessment Team, 1993). In this approach, each Team member distributes a number of "likelihood points" among each option or "bin," allowing him or her to express a variety of types and ranges of uncertainty. Distributing 10 points is common, though some teams have used 100 points; however, for many species, 100 points may indicate more specificity than is supported by the data. There is a clear relationship between characterizing uncertainty and this "likelihood point" method. A well-structured and clearly described expert opinion process allows for a distribution of likelihood points into multiple risk categories and, therefore, a summary of the level of certainty expressed by that group of experts.

To ensure all Team members are working with the same familiarity of the information (to the extent possible), sufficient discussion and opportunities for any member to ask questions of those more familiar with any particular aspect of a species' biology (or threats) should occur before Team members distribute their likelihood points individually. It is also of the utmost importance to have a clear discussion of the types of uncertainty Team members are considering when placing points into multiple bins, including the general rules Team members will follow. To adequately assess the uncertainty in estimating the overall risk of extinction, the biologist (or Team) should distribute likelihood points among three extinction risk bins, "high risk" "moderate risk" and "low risk," according to the team member's informed understanding of the true risk of extinction of the species. In deciding whether to place all likelihood points in one bin or to distribute them among bins to express a degree of uncertainty, the biologist (or Team) should draw on information on "the strength and consistency of the observed evidence, the range and consistency of model projections, the reliability of particular models as tested by various methods, and, most importantly, the body of work addressed in earlier synthesis and assessment reports" (NRC, 2010). The latter obviously includes the information compiled by the biologist (or Team) as part of the status review.

After all Team members have distributed their likelihood points among the three extinction risk bins, the Team should reconvene to discuss the results so that each Team member has an opportunity to explain or ask questions about the results. Any Team member who would like to change his or her point distribution may do so, though nobody is required to make any changes. Aggregate point distributions will be shared (individual point distributions can be anonymous, or the Team can agree that they will share their individual point distributions) so that the Team can have a good discussion of the results. Furthermore, each Team member should clearly document the rationale for their final individual point distribution. This is especially important for data-poor situations, which often lead to a high degree of uncertainty that may be reflected in high variance in extinction risk perception and likelihood point distribution, both within and among team members (i.e., individual team members may have points in all three bins, and distributions may differ substantially among members). In cases where there is considerable uncertainty, either due to lack of data or uncertainty in interpretation, a detailed narrative describing the sources of this uncertainty is particularly important. In order to list a species, the agency must affirmatively determine on the basis of a set of scientific facts that a species is at risk; the statute

does not allow for listings to be based on giving the species the "benefit of the doubt."[16] In the absence of any information about a species or threats to a species, the 'null hypothesis' is therefore one where all likelihood points are in the "low risk" category; specific supporting information must therefore be cited in order to put likelihood points into the "moderate" and "high risk" categories. In all cases, a clearly written, well documented narrative explanation of the distribution of likelihood points is an essential component of the status review report.

A more in-depth overview and a discussion of several examples of the use of structured expert opinion are provided in Appendix 2 of DeMaster *et al*. (2004). Annotated references for further guidance on structured decision making and risk analysis tools are provided below. Here we provide an illustration of the expert opinion-based assessment approach that we suggested in the body of this guidance document, adapted from those used by many Teams. It combines a risk matrix approach for assessing VP descriptors and threats and the likelihood point method for assigning extinction risk.

[16] Under Section 4, the default position for all species is that they are not protected under the ESA. A species receives the protections of the ESA only when it is added to the list of threatened species after an affirmative determination that it is "likely to become endangered within the foreseeable future." The agency cannot give the benefit of the doubt to the species under Section 4 if the data are uncertain or inconclusive. Such a reading would require listing a species as threatened if there is any possibility of it becoming endangered in the foreseeable future. This would result in all or nearly all species being listed as threatened. Instead, Congress vested the NMFS with discretion to make listing decisions based on consideration of the relevant statutory factors using the best scientific and commercial data available.

Illustration of an Expert Opinion-based Assessment Approach

First, after reviewing all relevant biological information for the species, each Team member assigns a risk score to each of the four VP descriptors, assuming that the threats influencing species' status will continue unchanged into the foreseeable future. This assumes that all of the effects of threats evaluated by the Team in an earlier section of the status review report are already fully manifest in the current species status and will in aggregate neither worsen nor improve in the foreseeable future. The scores are tallied (modes and range of scores), reviewed, and the range of perspectives discussed by the Team before using this information to assign overall extinction risk to the species (see Table X below). Although this process helps to integrate and summarize a large amount of diverse information, there is no simple way to translate the risk matrix scores directly into a determination of overall extinction risk. For example, a DPS with a single extant subpopulation might be at a high level of extinction risk because of high risk to spatial structure and connectivity, even if it exhibited low risk for other demographic criteria. Another species might be at risk of extinction because of moderate risks to several demographic criteria. The Team considers this summary of demographic risks and other pertinent information obtained by this approach in determining the species' overall level of extinction risk.

Risk Matrix for Evaluating VP Descriptors

Table X. Risk Matrix template used by the Team to capture comments and assessment of risk. Risks for each VP descriptor are ranked on a scale of 1 (very low risk) to 5 (very high risk).*

Risk assessment matrix

Risk category	**Risk score**
Abundance Comments:	
Growth rate/productivity Comments:	
Spatial structure and connectivity Comments:	
Diversity Comments:	

*The rankings are defined as follows:

1. Very low risk: It is unlikely that this descriptor contributes significantly to risk of

extinction, either by itself or in combination with other VP descriptors.

2. Low risk: It is unlikely that this descriptor contributes significantly to long-term or near future risk of extinction by itself, but there is some concern that it may, in combination with other VP descriptors.
3. Moderate risk: This descriptor contributes significantly to long-term risk of extinction, but does not in itself constitute a danger of extinction in the near future.
4. High risk: This descriptor contributes significantly to long-term risk of extinction and is likely to contribute to short-term risk of extinction in the near future.
5. Very high risk: This descriptor by itself indicates danger of extinction in the near future.

Overall Extinction Risk Determination

While a Team can use a narrative approach to evaluate overall extinction risk, many teams choose to use an expert opinion-based approach called the "likelihood point method," often referred to as the "FEMAT method" because it is a variation of a method used by scientific teams evaluating management options under the Northwest Forest Plan (Forest Ecosystem Management and Assessment Team, 1993). In this approach, each Team member distributes 10 likelihood points among the 3 extinction risk categories ("high risk" of extinction, "moderate risk" of extinction, or "low risk" of extinction), reflecting his or her opinion of how likely that category correctly reflects the true species status (Table Y). The levels of extinction risk associated with these terms are defined below.

A well-structured and clearly described expert opinion process allows for a distribution of likelihood points into multiple risk categories and, therefore, a summary of the level of certainty expressed by that group of experts. Thus if a member were certain that the species was in the low risk (not at risk) category, he or she could assign all 10 points to that category. A reviewer with less certainty about the species' status could split the points among two or even three categories. Note: in the absence of any information at all about a species or threats to a species, the 'null hypothesis' is one where all likelihood points are in the 'low risk' category. Specific supporting information must therefore be cited in order to put likelihood points into the moderate and high risk categories and each team member should clearly document the rationale for their individual point distribution. The overall extinction risk determination reflects informed professional judgment by each Team member. This assessment is guided by the results of the risk matrix analysis, integrating the best available information about demographic risks (VP descriptors) and specifically discussing threats (section 4(a)(1) factors) with expectations about likely interactions with threats to come to a single overall conclusion on the degree of extinction risk to the species.

Table Y. Likelihood point distribution voting sheet. Each Team member allocates 10 likelihood points among the three status categories. The numbers allocated across the categories should add up to 10 points. Low risk category = not at risk.

Species is at high risk	**Species is at moderate risk**	**Species is at low risk**	**Total = 10 pts.**

Rationale: Each Team member should clearly document the rationale for their final individual point distribution. In cases where there is considerable uncertainty, either due to lack of data or uncertainty in interpretation, a detailed narrative describing the sources of this uncertainty is particularly important. In all cases, a clearly written, well documented narrative explanation of the distribution of likelihood points is an essential component of the status review report.

The three extinction risk categories are defined as:

> High risk: A species or DPS with a high risk of extinction is at or near a level of abundance, productivity, spatial structure, and/or diversity that places its continued persistence in question. The demographics of a species or DPS at such a high level of risk may be highly uncertain and strongly influenced by stochastic or depensatory processes. Similarly, a species or DPS may be at high risk of extinction if it faces clear and present threats (e.g., confinement to a small geographic area; imminent destruction, modification, or curtailment of its habitat; or disease epidemic) that are likely to create imminent and substantial demographic risks.
>
> Moderate risk: A species or DPS is at moderate risk of extinction if it is on a trajectory that puts it at a high level of extinction risk in the foreseeable future (see description of "High risk" above). A species or DPS may be at moderate risk of extinction due to projected threats or declining trends in abundance, productivity, spatial structure, or diversity. The appropriate time horizon for evaluating whether a species or DPS will be at high risk in the foreseeable future depends on various case- and species-specific factors. For example, the time horizon may reflect certain life history characteristics (e.g., long generation time or late age-at-maturity) and may also reflect the time frame or rate over which identified threats are likely to impact the biological status of the species or DPS (e.g., the rate of disease spread). (The appropriate time horizon is not limited to the period that status can be quantitatively modeled or predicted within predetermined limits of statistical confidence. The biologist (or Team) should, to the extent possible, clearly specify the time horizon over which it has confidence in evaluating moderate risk.)
>
> Low risk: A species or DPS is at low risk of extinction if it is not at moderate or high level of extinction risk (see "Moderate risk" and "High risk" above). A species or DPS may be at low risk of extinction if it is not facing threats that result in declining trends in abundance, productivity, spatial structure, or diversity. A species or DPS at low risk of extinction is likely to show stable or increasing trends in abundance and productivity with connected, diverse populations.

References on Qualitative Risk Analysis Tools and Expert Opinion

General References

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with DecisionTools®. Duxbury, Pacific Grove, CA. (Good general textbook loaded with examples. Comes with student version of popular decision analysis software.)

Drake J.S., E.A. Berntson, J.M. Cope, R.G. Gustafson, E.E. Holmes, P.S. Levin, N. Tolimieri, R.S. Waples, S.M. Sogard, and G.D. Williams. 2010. Status review of five rockfish species in Puget Sound, Washington: bocaccio (*Sebastes paucispinis*), canary rockfish (*S. pinniger*), yelloweye rockfish (*S. ruberrimus*), greenstriped rockfish (*S. elongatus*), and redstripe rockfish (*S. proriger*). U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-108, 234 p.

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National Research Council. 1995. Making ESA Decisions in the Face of Uncertainty. Pp. 157-178 *in* Science and the Endangered Species Act. National Academy Press, Wash., DC. (Great summary of the basic ideas about structuring decisions in an ESA context.)

Risk Analysis and Decision Making Under Uncertainty

Akcakaya, H.R., et al. 2000. Making consistent IUCN classifications under uncertainty. Conservation Biology 14(4):1001-1013. (Describes how to use intervals ('fuzzy numbers') in place of point estimates when species information is uncertain, to assure that decisions take full account of uncertainties.)

Anderson, J.L. 1998. Embracing uncertainty. Conservation Ecology 2:2. Online at: http://www.consecol.org/vol2/iss1/art2 . (Presents tactics for using Bayesian methods, so uncertainty can be better treated in decision making. Good discussion of human cognition of uncertainty and probability.)

Burgman, M.A., S. Ferson and H.R. Akçakaya. 1993. Risk Assessment in Conservation Biology. Chapman Hall, New York. 314 pp. (Thorough description of risk assessment simulation modeling for conservation biology contexts (e.g., population viability analysis). See Morris and Doak for more current treatment.)

Maguire, L.A. 1991. Risk analysis for conservation biologists. Conservation Biology 5(1):123-125. (A call for using the risk analysis framework for decisions about environmental impacts, with discussion of traditional and alternative burden of proof standards.)

Morris, W.F. and D.F. Doak. 2003. Quantitative Conservation Biology: Theory and Practice of Population Viability Analysis. Sinauer Associates, Inc. 480pp. (Covers multiple approaches

to population viability analysis, including 'count-based PVA' (extrapolation of trends from survey data), demographic simulation, and habitat occupancy (e.g., presence-absence modeling) approaches. Excellent, more technical reference.)

Modeling

Beres, D.L., C.W. Clark, G.L. Swartzman and A.M. Starfield. 2001. Research notes: truth in modeling. Natural Resource Modeling 14(3):457-463. (A very short and to-the-point article on what modelers should always describe when reporting modeling projects.)

Oreskes, N., K. Shrader-Frechette and K. Belitz. 1994. Verification, validation and confirmation of numerical models in the earth sciences. Science 263:641-646. (Discussion of often misused terminology, and what you really need to know about simulation model evaluation and reliability in the biological as well as earth sciences.)

Peck, S.L. 2000. A tutorial for understanding ecological modeling papers for the nonmodeler. American Entomologist 46(1):40-49 [condensed in 2001 *in* Conservation Biology in Practice 2(4):36-40]. (A quick summary of modeling concepts, with a nice glossary. Covers spatial and demographic modeling.)

Starfield, A.M. 1997. A pragmatic approach to modeling for wildlife management. Journal of Wildlife Management 61:166-174. (Easily read summary of very practical ideas about how to model, and how to look at others' models.)

Starfield, A.M. and A.L. Bleloch. 1991. Building Models for Conservation and Wildlife Management. Burgess International Group, Inc., Edina, MN. 253pp. (How-to book on creating useful models. Helps you decide what kind of model fits your problem, from deterministic and unstructured to stochastic, spatially-structured and individual-based models.)

Expert Opinion and Group Facilitation

Ayyub, B.M. 2001. Elicitation of Expert Opinions for Uncertainty and Risks. CRC Press, Boca Raton, FL. 302pp. (The best, though technical, textbook on how to elicit and use expert opinion for risk analysis.)

Andelman, S.J. et al. 2001. Scientific standards for conducting viability assessments under the National Forest Management Act: report and recommendations of the NCEAS working group. Chapter 8: Expert Opinion. National Center for Ecological Analysis and Synthesis, Santa Barbara, CA. see: http://www.nceas.ucsb.edu/ Open "Research Projects" tab on the left sidebar; search for: "Review of Forest Service Viability Assessment Processes;" when it

opens click on NCEAS viability final report 1201 in PDF format. (Concise guidance on using experts and facilitating expert groups to aid decisions about species conservation.)

Coughlan, B.A.K. and C.L. Armour. 1992. Group decision-making techniques for natural resource management applications. U.S. Fish and Wildlife Service Resource Publication 185. D.C. (Overview of techniques used to aid group decision making, focusing on group behaviors and processes more than the details of decision analysis methods.)

Marcot, B.G. 1997. Use of expert panels in the terrestrial ecology assessment, Interior Columbia Basin ecosystem management project. Extract from Marcot, B.G., M.A. Castellano, J.A. Christy, L.K. Croft, J.F. Lehmkuhl, R.H. Naney, R.E. Rosentreter, R.E. Sandquist, and E. Zieroth. 1997. Terrestrial ecology assessment. Pp. 1497-1713 in: T.M. Quigley and S.J. Arbelbide, ed. An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basins. Volume III. USDA Forest Service General Technical Report PNW-GTR-405. USDA Forest Service Pacific Northwest Research Station, Portland, OR. 1713 pp. Available online at: http://www.spiritone.com/~brucem/icbexexp.htm (Succinct summary of how expert panels were used; easily accessed online.)

Shaw, C.G. III. 1999. Use of risk assessment panels during revision of the Tongass Land and Resource Management Plan. General Technical Report PNW-GTR-460. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. (Describes the protocol developed by the US Forest Service to conduct multiple species viability assessments using expert panels and the 'modified Delphi' approach (adapted from the NW Forest Plan effort (FEMAT 1993)).)

Some Web Resources for Structured Decision Making

(NOAA does not necessarily endorse any of the products referenced.)

Decision Analysis Society (especially see the "Field of Decision Analysis" link)
http://faculty.fuqua.duke.edu/daweb/

International Society on Multiple Criteria Decision Making
http://www.terry.uga.edu/mcdm/

Society for Risk Analysis
http://www.sra.org/

RAMAS Red List (IUCN species risk classification)
http://www.ramas.com/redlist.htm

NatureServe sites describing Heritage species ranking methodology
http://www.natureserve.org/prodServices/heritagemethodology.jsp

http://www.natureserve.org/explorer/ranking.htm

Appendix D: *Examples of Significant Portion of its Range Analyses*

Example 1: Determining that a portion is significant, then determining that it is also threatened, and then determining that the portion meets the criteria of the DPS policy.

SPOIR analysis from the Status Review of the African Coelacanth (October 2014):

"Because we find that the species is at a low risk of extinction throughout its range, we must also consider whether it may have a higher risk of extinction in a significant portion of its range per the Significant Portion of its Range Policy (79 FR 37577; July 1, 2014). After a review of the best available information, we identified the Tanzanian population of the African coelacanth as a population facing concentrated threats because of increased catch rates in this region since 2003, and the threat of a deep-water port directly impacting coelacanth habitat in this region. If we believe this population also constitutes a significant portion of the range of the African coelacanth, then we would evaluate the extinction risk of this population to determine whether it is threatened or endangered in that portion.

We proceeded to evaluate whether this population represents a significant portion of the range of the African coelacanth. The Tanzanian population is one of only three confirmed populations of the African coelacanth, all considered to be small and isolated. Because all three populations are isolated, the loss of one would not directly impact the other remaining populations. However, loss of any one of the three known coelacanth populations could significantly increase the extinction risk of the species as a whole, as only two small populations would remain, making them more vulnerable to catastrophic events. While the Tanzanian and Comoran populations are only a few hundred miles apart, ocean currents are thought to have led to their divergence over 200,000 years ago, and connectivity between them is not thought to be maintained (Nikiado et al., 2011). The South African population is separated from the Comoran and Tanzanian populations by thousands of miles. The Tanzanian population exhibits the greatest genetic divergence, suggesting that it may be the most reproductively isolated among them (Lampert et al., 2012). Potential catastrophic events such as storms or significant temperature changes may affect the Comoran and Tanzanian populations simultaneously, due to their closer geographic proximity. The South African population, while not as genetically isolated, may experience isolated catastrophic events due to its geographic isolation. Loss of any single coelacanth population would put the species at greater risk of loss from catastrophic events as storms, disease, or temperature anomalies. This reasoning supports our conclusion that the Tanzanian population comprises a significant portion of the range of the species because this portion's contribution to the viability of the African coelacanth is so important that, without the members in that portion, the African coelacanth would be likely to become in danger of extinction in the foreseeable future, throughout all of its range.

Because the Tanzanian population of the coelacanth was determined to represent a significant portion of the range of the species, we performed an extinction risk assessment on the Tanzanian population by evaluating how the demographic factors (abundance, productivity/growth rate, spatial structure/connectivity, and diversity) of the species would be impacted by the ESA section 4(a)(1) factors, considering only those factors affecting the Tanzanian population.

Coelacanth abundance across its entire range is not well understood, and no abundance estimates exist for the Tanzanian population. Based on general knowledge of the African coelacanth, the Tanzanian population is likely associated with very restricted and specific habitat requirements and low growth rates. We conclude that it is likely that the population size of the Tanzanian population is small for the same reasons described above for the species as a whole: they exhibit low levels of diversity (Nikaido et al., 2013), long generation times, and restricted habitat (Hissmann et al., 2006; Fricke et al., 2011). The likelihood of low abundance makes the Tanzanian population more vulnerable to extinction by elevating the impact of stochastic events or chronic threats resulting in coelacanth mortality.

Growth rate and productivity for the Tanzanian population is thought to exhibit similar characteristics to other populations of the species. The species as a whole has one of the slowest metabolisms of any vertebrate. The extremely long gestation period and late maturity makes the Tanzanian population particularly vulnerable to external threats such as bycatch, possibly impeding recovery from mortality events (Froese et al., 2000).

The Tanzanian population is thought to represent a single isolated population of the species. It has been estimated that this population diverged from the rest of the species 200,000 years ago (Nikaido et al., 2011). Differentiation of individuals from the Tanzanian population may relate to divergence of currents in this region, where hydrography limits gene flow and reduces the potential for drifting migrants. The isolated nature of the Tanzanian population lowers the potential for its recovery from external threats; the population is not thought to maintain connectivity with other populations, and thus has no source for replacement of individuals lost outside of its own reproductive processes. Fast-moving currents along the Eastern coast of Africa are thought to prevent connectivity among populations in the region (Nikaido et al., 2011). This may be particularly true for Tanzania. We consider current evidence for the Tanzanian population's high isolation and low (or no) connectivity with the rest of the species to contribute to a moderate risk of extinction, as it may increase vulnerability of this population by preventing its replacement and recovery from external threats and mortality events, and increase the potential for extinction.

Genomic analyses of individuals from the Tanzanian population and other representatives of the species reveal that divergence and diversity within and among populations is very low (Nikaido et al., 2013). Low levels of diversity reflect low adaptive and evolutionary potential, making the Tanzanian population particularly vulnerable to environmental change and episodic events. These events may reduce diversity further, and result in a significant change or loss of variation in life history characteristics (such as reproductive fitness and fecundity), morphology, behavior, or other adaptive characteristics. Due to the Tanzanian population's low diversity, this population may be at an increased risk of random genetic drift and could experience the fixing of recessive detrimental genes that could further contribute to the species' extinction risk (Musick, 2011).

Regarding habitat threats to the Tanzanian population, loss and degradation of coelacanth habitat can take the form of pollution, dynamite fishing, sedimentation, and direct loss through development. Future human population growth and land use changes off the coast of Tanzania increase these threats to the Tanzanian population, but their trends and impacts are highly

uncertain. In general, the coelacanth is largely buffered from habitat impacts due to its occurrence in deep water, and general effects of pollution and development are similar to those described for the rest of the species. However, specifically related to the Tanzanian population, direct loss of habitat may occur if the deep port of Mwambami Bay is developed. The port is planned to be built just 8 km south of the original old Tanga Port, and this would include submarine blasting and channel dredging and destruction of known coelacanth habitat in the vicinity of Yambe and Karange islands - the site of several of the Tanzanian coelacanth catches. The new port is scheduled to be built in the middle of the Tanga Coelacanth Marine Park. The construction of Mwambani port is part of a large project to develop an alternative sea route for Uganda and other land-locked countries that have been depending on the port of Mombasa. The plans for Mwambani Bay's deep-sea port construction appear to be ongoing, despite conservation concerns. Whether plans to build this port will come to fruition remains uncertain, but if built, the deep port would be devastating to the Tanzanian population by destroying habitat directly. For the Tanzanian population, the construction of this deep-water port could be catastrophic, and it is clear that the boundaries of the new Tanga Marine Park are insufficient in halting plans for the port's development.

As for impacts from overutilization, bycatch has historically been thought to pose the greatest threat to the coelacanth. While survey data from the Comoros show there is no observed link between coelacanth bycatch and population decline, since 2003 in Tanzania, coelacanth catch rates have been more than 3 times greater than ever observed in the Comoros, at over 10 fish per year. It is unclear whether this catch rate is sustainable due to limited information on trends and abundance of the Tanzanian population. The further expansion of a shark gill net fishery in Tanzania, as has been observed over the last decade, could result in additional coelacanth bycatch. Bycatch in Tanzania is an ongoing threat. While direct data assessing Tanzanian coelacanth population decline are not available, the relatively high and persistent catch rate in this region has the potential to deplete this small and isolated population, which has life history characteristics that greatly impede its recovery and resiliency to mortality.

We consider the threat of overutilization for scientific purposes, public display, or for the curio trade as low for reasons described above, as they apply to the rest of the species.

We consider the threat of inadequate regulatory mechanisms as low for the Tanzanian population for the same reasons described above for the rest of the species. Additionally, we classify the risk of climate change as low for the Tanzanian population for the same reasons described above for the rest of the species.

Overall, the Tanzanian population's demographic factors make it particularly vulnerable to ongoing and future threats, which pose a moderate risk to the species. Based on the best available information, threats of bycatch to the Tanzanian population appear to be persistent, and the potential development of a deep port within this population's habitat could be catastrophic to the population in the foreseeable future. Thus, we find that the Tanzanian population is at a moderate risk of extinction due to current and projected threats."

When F/PR developed the proposed and final rules for this species, we found that the Tanzanian population met the DPS Policy criteria, and therefore, as required by the SPOIR Policy, we listed only the Tanzanian DPS of the African coelacanth as threatened based on its threatened status in a significant portion of the African coelacanth's range.

Example 2: Determining whether a particular portion of the range of a DPS can be considered significant and whether another particular portion of the range is threatened or endangered.

In the *Final Rule to Delist the Eastern Distinct Population Segment of the Steller Sea Lion* (78 FR 66139, November 4, 2013), we found that the DPS was not threatened or endangered throughout its range. Therefore, we needed to evaluate whether it was threatened or endangered in a significant portion of its range. Our approach for Steller sea lions was to first determine whether any portions could be considered significant per the draft SPOIR policy. This example illustrates how we can first look for portions that are significant and also how we can first look for portions that have a higher concentration of threats.

"As noted in the proposed rule to delist the eastern DPS of Steller sea lions (77 FR 23209; April 18, 2012), we initially identified only one portion of the eastern DPS's range that warranted further consideration: the southern portion of the range in California. We specifically considered whether the southern portion of the range in California constituted an SPR because the Recovery Plan indicated that there was concern over the performance of rookeries and haulouts in this portion of the range, especially in contrast to the growth observed in southeast Alaska. Following the receipt of public comments on the proposed rule, we also evaluated population, genetic, ecological, and other relevant information to determine whether either the portion of the range within California or the portion of the range within the California Current Ecoregion constitutes an SPR of the eastern DPS.

We evaluated the abundance of Steller sea lions within California, their productivity, movements, habitat use, and new information on their genetic characteristics to determine whether the California portion of the eastern DPS range is so significant that without that portion, the long-term viability of the entire DPS would be so impaired that the species would be in danger of extinction, either currently or within the foreseeable future. The history of the species following its protection indicates that this is not the case. Despite losing rookeries in California, poor pup production at the Farallon Islands, and the fact that the overall statewide population is about one-third of the numbers present in the first half of the century, the overall non-pup trend, as assessed by non-pup counts, for the trend sites within the State of California from 1990-2011 has been stable. Further, pup production in California has increased at about 2.9% per year from 1996-2011. While we do not fully understand the causes of poorer performance of Steller sea lions in California compared to the rest of the DPS, these data indicate that they are not in decline. More importantly, the overall population recovery has met or exceeded the demographic recovery criterion. Increases in numbers throughout much of the rest of the DPS began ten to fifteen years before abundance began to increase in California. Thus, available information does not support a conclusion that the California population's contribution to the viability of the eastern DPS is so important that, without that portion, the eastern DPS

would be in danger of extinction now or in the foreseeable future. Therefore, we have concluded that California does not constitute an SPR."

With regard to whether the California Current ecosystem constitutes an SPR, NMFS finds that the evidence is equivocal, as discussed further in the Status Review (NMFS 2013a). However, regardless of whether the California Current portion of the range is an SPR, Steller sea lions within the California Current portion of the range do not meet the definition of a threatened or endangered species under the ESA. This conclusion is based on trend information presented in the Status Review and on the fact that no threats sufficient to impede the recovery of the population now or within the foreseeable future were identified. In other words, if NMFS assumes that the California Current portion is an SPR, NMFS does not find that Steller sea lions are in danger of extinction there or likely to become so within the foreseeable future. The underlying trend information on pups (for California and Oregon) and non-pups (for California, Oregon and Washington) is provided in the Status Review (NMFS 2013a). The threat information is provided in the Status Review (NMFS 2013a) and summarized above under our consideration of the five factors that must be considered in listing decisions (see "Evaluation of the ESA Section 4(a)(1) Factors and Associated Recovery Criteria")."

Appendix E: ***Template for a Terms of Reference Document***

[Species name(s)]
Status Review Team (SRT)
Terms of Reference
[date]

1. INTRODUCTION AND BACKGROUND

On [date], the National Marine Fisheries Service (NMFS) received a petition from the [petitioner] requesting that [action(s) requested]. On [date], NMFS determined that the petition presented substantial information indicating that the petitioned action may be warranted for [species name(s) or populations, if applicable] (a "positive 90-day finding") [but not for [population(s)] (a "negative 90-day finding"), if applicable] and published the finding in the *Federal Register* ([citation, date]), pursuant to 50 CFR 424.14.

The [regional RA(s) or F/PR Director] decided to establish a Status Review Team (SRT) to compile the best available scientific and commercial information on [the species], evaluate the demographic risk to the species, analyze the five factors listed under section 4(a)(1) of the ESA as they pertain to this risk, and estimate extinction risk to the species. The best available scientific and commercial information includes, but is not limited to, published and unpublished literature, reports, models, and other data, coupled with numerous personal communications for obtaining updated information. New field surveys and other forms of research are NOT required, though may be included if results are available during the time that the review is being conducted.

2. ROLES AND RESPONSIBILITIES

NMFS will provide administrative support, such as scanning, procurement of supplies, and expenses related to distributing materials. In addition, NMFS may contract for services to the SRT or to outside experts for specific products or to facilitate the meetings and deliberations relating to the drafting and assembling of the Status Review report or other documents for the team's use.

2.1 Structure

2.1.1 NMFS Liaison(s)

The NMFS liaison[17] is/are [name(s) and affiliation(s)], and the liaison's responsibilities are: (1) serve as a conduit for communication between the SRT and the Regional Office/F/PR and between NMFS and other NOAA offices as appropriate; (2) assist in coordination of meetings; (3) provide guidance concerning the ESA listing/delisting process, and (4) serve as Custodian of the Decision File for the record.

[17] The NMFS liaison will be a Regional Office or F/PR staff member.

Given the responsibilities associated with a liaison, it is important that the liaison have experience associated with conducting ESA status reviews and familiarity with the ESA Section 4 listing/delisting provisions and associated agency policies. The liaison should have ready access to staff at the Regional Office and/or Headquarters in order to ensure efficient and effective communications between the team and the Regional Office/HQ throughout the status review process. At the discretion of the Regional Administrator, an individual serving as the liaison may also serve as a full member of the SRT.

2.1.2 Status Review Team

The Chair for the [species name(s)] SRT is [name], [affiliation], who was designated as Chair by [name/affiliation]. The SRT Chair will (1) chair the SRT; (2) organize, schedule, and facilitate team meetings; (3) coordinate the various writing and other assignments for drafting the Status Review report; and (4) keep the SRT moving forward on an agreed upon timeline and make sure steady progress is made.

The members of the [species name(s)] SRT are: [name (affiliation), name (affiliation), etc.].

The SRT may also call on other Federal and non-Federal subject matter experts to provide expert information to the SRT on an individual basis and not for the purpose of attempting to reach a consensus or provide group advice to the agency. However, these experts will not be involved in any deliberations of the SRT.

All meetings and documents produced by the SRT are confidential until the final status review report is published. All participants in this effort, including those acting in an advisory capacity to the SRT, are required to keep these discussions and documents confidential.

2.1.3 Function & Charge

This SRT was established to assess the status of the [species name(s)] identified in the positive 90-day finding. The SRT must review and synthesize the best available scientific and commercial information, render expert opinion, and prepare a written report (see 3. Status Review Report Content). The objective for the SRT is to draft a Status Review report that provides thorough science-based analyses regarding the demographic risks to the species, the five section 4(a)(1) factors under the ESA as they pertain to the species, and extinction risk to the [species name(s)], with consideration of applicable policies and statutory terms. The charges to the SRT are listed below. For more details on any of the following aspects of a Status Review Report, see Listing Guidance (link).

a) If the Region (or F/PR) has requested that the SRT identify DPSs of a vertebrate species, the SRT will apply the DPS Policy criteria (scientific and policy considerations) to determine whether any populations of the species appear to satisfy the DPS Policy criteria. If so, the SRT will conduct the analyses in steps c) through e) for the taxonomic species or subspecies, as well as for each such population.

b) The SRT will evaluate and describe the demographic risks (4 VP descriptors) to the species (abundance, spatial distribution, productivity, diversity).

c) The SRT will describe the Section 4(a)(1) factors of the ESA identified below, as they relate to the demographic risks to the species:

- Present or threatened destruction, modification, or curtailment of the species' habitat or range;
- Overuse for commercial, recreational, scientific, or educational purposes;
- Disease or predation;
- Inadequacy of regulatory mechanisms; and
- Other natural or manmade factors affecting its continued existence.

The SRT, to the extent possible, is asked to describe the links between demographic risks and these causative factors. The SRT will need to adapt its analysis according to the quantity and quality of the best available information.

d) The SRT will follow the guidance in the listing guidance to score or describe the 4 VP descriptors, while considering the section 4(a)(1) factors and how they affect the status of the species and then to synthesize the best available information in the report and estimate the risk of extinction of the species, qualitatively (e.g., low, moderate, or high risk of extinction), and if possible, quantitatively (e.g., x probability of extinction in y years), too.

e) The SRT will follow the direction in the listing guidance to conduct a "significant portion of its range" analysis if it concludes that the species is at low risk of extinction.

The Status Review Report may also provide information related to consideration of critical habitat for [species name(s)], but the determination of critical habitat is not required as part of the Status Review Report.

The evaluations and analyses of any species being considered for listing under the ESA must be based solely on the best scientific and commercial data available, and a listing determination will be made by NMFS after considering ongoing conservation efforts. Therefore, this Status Review Report will not make reference to the possible economic or other impacts of any future listing, and the SRT will not evaluate such impacts.

The SRT is NOT charged with making listing recommendations, and the Status Review Report should underscore that the conclusions do not represent conclusions regarding the species' listing status under the ESA. Proposed listing recommendations are the responsibility of [region(s) or F/PR]. However, [region(s) or F/PR] will rely on the Status Review Report, any other information it may obtain, ongoing conservation efforts, and its expertise with ESA regulations and policies, when making any listing recommendations.

Conclusions for the Status Review report will be based on a variety of mechanisms for reaching a conclusion. These mechanisms include, but are not limited to, consensus, agreement of a simple majority, defined as [x out of y] agreement within the SRT, allocation of likelihood points among options, or qualitative assignment of [e.g., high, moderate, or low risk]. Regardless of mechanisms used, all Status Review reports must also include qualitative extinction risk conclusions in terms of high, moderate, or low risk of extinction. If scoring or allocation of likelihood points is used, the Team's conclusions must be accompanied by a robust explanatory narrative. Scoring may be confidential within the group to prevent pressure amongst peers; however, each Team member should clearly document the rationale for his or her individual point distribution. Scoring on a particular topic may occur more than once with intervening discussion of the previous scoring exercise. Members may abstain from scoring if they do not feel they have the information or expertise necessary to form an independent opinion, though abstention is not encouraged. If scoring occurs during the absence of one or more SRT members, those scores will stand if the scoring of the missing member would not have changed the outcome of the scoring. A delay of scoring or re-scoring until the SRT member's return may occur at the SRT's discretion. Minority opinions will be documented in the administrative record. Significant differences of opinion or apparent conflicts in available information will be documented in the text of the Status Review report, as well as in the administrative record. Minority reports will be authored by the dissenting members and will be included in the Status Review Report. The decision-making process for each element that is scored also will be documented in the Status Review report and in the administrative record. All elements of the Status Review report will remain confidential until the report is published on the [website] for public review.

SRT participation may include meetings, video, web, or teleconferences, email exchange, analyses, writing and review of documents.

3. STATUS REVIEW REPORT CONTENT

Generally, the Status Review Report should include:

- Introduction/Background – Brief statement to indicate that the review was conducted in response to a petition; description of approach to the review analysis
- Species biology and ecology, including abundance and distribution; discussion of any new information that is relevant to species status
- DPS analysis, if requested by the Region or F/PR
- Evaluation of demographic risks (abundance, spatial distribution, productivity, diversity) to the species or subspecies, or any identified DPSs
- Assessment of the ESA section 4(a)(1) factors and how they contribute to extinction risk
- Assessment of overall extinction risk – qualitative or quantitative
- "Significant portion of its range" (SPOIR) analysis (if necessary)
- Conclusions
- References and Appendices

Existing NMFS Status Review reports, such as the [examples of reports] will be used as guidelines for the structure of the Status Review Report.

Attachments:

Positive 90-day finding published in *Federal Register*.

Appendix F*: Template for a Table of Contents for a Status Review Report*

Status Review of the [Species name (scientific name)]

Executive Summary

Introduction [should include a brief statement of scope and purpose of report]

Life History and Ecology
- Taxonomy and Distinctive Characteristics
- Range and Habitat Use
- Reproduction and Growth
- Diet and Foraging Behavior
- Social Behaviors

Distribution and Abundance
- Historical Population Size and Population Trends
- Population Structure
- Description of the Fisheries and Current Catch Estimates
- Species Stock Assessment [if applicable]

Distinct Population Segment Analysis [if applicable]
- Consideration of the Species Question
- Criteria for Identifying Distinct Population Segments
- Distinct Population Segments of [Species]
  - Discreteness
  - Significance
  - Conclusions

Discussion of Viable Population Descriptors and How They May Contribute to Extinction Risk
- Abundance
- Productivity/Growth Rate
- Spatial Distribution/Connectivity
- Diversity

Discussion of ESA Section 4(a)(1) Factors and Contribution to Extinction Risk
- Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range
- Overutilization for Commercial, Recreational, Scientific, or Educational Purposes
- Competition, Disease or Predation
- Evaluation of Adequacy of Existing Regulatory Mechanisms
- Other Natural or Manmade Factors Affecting the [Species']Continued Existence

Extinction Risk Analysis
- Foreseeable Future [Discussion of why Team chose a particular FF (or several FFs]
- Methods [Details on how Team will conduct analysis, data quality, how to deal with uncertainties]

Demographic Analysis [Explanatory, Scoring of Four VP Factors, and/or Quantitative]
Threats Analysis [Explanatory and/or Scoring]
Overall Extinction Risk Conclusions [to include thorough, strong rationale for conclusions of high, moderate, or low extinction risk]
Throughout the range of the species
Significant Portion of its Range Analysis [if applicable]

Summary and Conclusions

References